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Math. 8

A TREATISE OF TRIGONOMETRY,

PLANE and SPHERICAL,
THEORETICAL and PRACTICAL.

In which the ſeveral Caſes of *Plane* and *Spherical* Triangles are ſolved, *Inſtrumentally* and *Arithmetically*.

As likewiſe a TREATISE OF STEREOGRAPHIC and ORTHOGRAPHIC Projection of the SPHERE.

In which the *Principles* and *Theorems* on which they depend, are clearly Demonſtrated, and the Practice naturally deduced from thoſe Demonſtrations.
Illuſtrated in the Stereographic Projection of the ſeveral Caſes in Right and Oblique Angled, Spherical, Triangles: So that the Requiſites may be found without Calculation, by Scale and Compaſs.
To which is added a Correct Table of Logarithms, Sines, Tangents and Secants.

By SAM. HEYNES, late Reader of the Mathematics to His Majeſty's Engineers.

LONDON,
Printed by *J. Matthews*, for *Jer. Seller* and *Char. Price*,
at the *Hermitage-Stairs* in *Wapping*. [illegible]701.

An Explanation of the Symbols us'd in this Treatiſe.

$+$		Addition.
$-$		Subſtraction, *or the difference of the two Quantities between which 'tis plac'd.*
$\backsim$		The Difference *of two Quantities when it is not known in which the Exceſs lies.*
$\times$		Multiplication.
$>$		Majority, *or greater than.*
$<$		Minority, *or leſſer than.*
$=$		Equality.
$\surd$		Radicality, *or Square Root.*
$\square$		Rectangle, *or Product.*
R		Radius.
S	Signifies	Sine.
Σ		Co-ſine.
ſ		Secant.
σ		Co-ſecant.
T		Tangent.
τ		Co-tangent.
V		Verſed-ſine.
v		Verſed-ſine *of the Supplement.*
L		Right-angle.
Z*cr*		Sum *of the Legs.*
X*cr*		Difference *of the Legs.*
Z*LL*		Sum *of the Angles.*
X*LL*		Difference *of the Angles.*

A Table of ERRATA.

Page	Line	For	Read
89	22	DD	DF.
90	13	FG	FO.
91	20	ABH	A*b*H.
92.	1	A*bb*	A*b*H.
100	17	*on*	*in.*
109	11	A *its Center*	E *its Center.*
110	8	AD*q*	EB*q.*
118	1	*make*	*Measure.*
120	9	*Fig.* VI.	*Fig.* IV.
121	3	*add*	*Plate* XII. *Fig.* V.
132	19	25 *Deg.*	25 *deg.* 30′.

TO

Capt. *Edm. Halley*

Fellow of the Royal Society, *&c.*

SIR,

THis Treatiſe of *Trigonometry* and *Stereographic Projection* is humbly Dedicated to You; I being glad of this opportunity of more Publickly Teſtifying the Reſpect I bear to You, and my Obligations for the Kindneſſes conferr'd by You upon

Your Humble and
Oblig'd Servant

SAM. HEYNES.

TO THE
READER.

THis Treatiſe is accommodated both to the Theoretic and Practic Reader; a Practical Treatiſe only, would never pleaſe the former, nor a Theoretic the latter.

In order to the former End I have made uſe of the moſt Conciſe and Elegant Demonſtrations I could find, and particularly from that incomparable Treatiſe of Trigonometry, Written by the Learned Mr. Caſwell *A. M. of* Oxford.

And that I might Anſwer the latter End the better, I have given the actual Solutions of the ſeveral Caſes both of Plane and Spherical Triangles in Numbers, Natural and Artificial; and likewiſe by the Gunter's Scale; and have taken great care that the ſeveral Directions to Practice ſhould be ſo plane and eaſie, that they might be made uſe of effectually by Perſons that are not ſo well grounded as yet in Geometry, &c. *as to underſtand the Demonſtrations.*

As to the other Treatiſe of Stereographic Projection *of the* Sphere, *which is a branch of Perſpective; I have Demonſtrated the Principles and Theorems on which it depends, and from thoſe Theorems have ſhew'd the reaſon of the ſeveral Methods made uſe of in Practice, making thereby the Projection of the Sphere upon the Plane of any great Circle to become eaſie, and likewiſe the Menſuration of any arc ſo Projected.*

And laſtly, I have ſhew'd you how to Project the ſeveral Caſes of Spherical Triangles both Right and Oblique, the Reaſons of all which Precepts naturally flowing from Preceding Propoſitions: There hath been nothing wrote in Engliſh *giving ſo full Account of this Matter, which is humbly Submitted to the Judicious Reader. By*

S. H.

SOME FEW Geometrical Problems.

Neceſſary to be known in Order to find the Requiſits of Right and Oblique Triangles, *by a* Scale *of Equal* Parts, *and a* Line *of* Chords.

PROBLEM I.

From a Point in a Line given, to erect a Perpendicular.

LET the Line given be *a b*, and the Point given *e*; take two Points *c*, *d*, equally diſtant from *e*: Then putting the Foot of your Compaſſes in *c* and *d*, open'd to any diſtance greater than *c e*, and ſtrike two Arches cutting one another in *f*. Then draw the Line *f e*, it ſhall be the Perpendicular required. *Plate* I. *Fig.* I.

PROB. II.

To divide a given Right-line into two equal Parts.

Plate I.
Fig. II.

Let the Line given be *a b*; upon the Point *a*, with your Compaſſes open'd to any Diſtance greater than half the line *a b*, deſcribe the Arch *c d*; then puting the Foot of your Compaſſes the Point in *d*, and with the ſame opening deſcribe an Arch cutting the other in *c* and *d*, the Line *c d* ſhall Biſſect the Line given in *e*.

PROB. III.

From a Point given without, to let fall a Perpendicular to a Line given.

Plate I.
Fig. III.

Let the Point given be *g*, and the Line given *a b*; put one Foot of your Compaſſes in *g*, and with any Diſtance, greater than the neareſt Diſtance of that Point from the Line given, croſs the Line given in the Points *c* and *d*, then putting the Foot of your Compaſſes on the Points *c* and *d*, with the ſame opening of your Compaſſes deſcribe two Arches cutting one another in *f*, a Ruler being laid to *g* and *f*, draw the Line *g h*, it ſhall be the Perpendicular requir'd.

PROB. IV.

From the end of a Line given, to erect a Perpendicular.

Plate I.
Fig. IV.

1. Upon the Point *b* with your Compaſſes open'd to any Diſtance *b c*, deſcribe the Arch *c d e*, then your Compaſſes at this opening will reach from *c* to *d*, and from *d* to *e*, upon the Points *d* and *e*, and with the ſame opening of your

Compaſſes deſcribe two Arches cutting one another in *f*; *f b* ſhall be the Perpendicular.

2. Your Compaſſes being open'd at any Diſtance, put one Foot in *b*, and the other any where in *c*, then turn about the Foot that was in *b*, till it croſs the Line *a b* given in *d*, draw the Line *d a f*, ſo that $cf = cd$, then is *f b* a Perpendicular.

Plate I. *Fig.* V.

P R O B. V.

From a Point given, to draw a Parallel to a Line given.

Let the Point given be *c*, and the Line given *a b*; From the Point *c* as a Center, ſtrike an Arch cutting the given Line *a b* in *a*, then take *a c* in your Compaſſes, and putting one Point any where in the Line *a b*; ſuppoſe in *b*, with the other deſcribe an Arch, then take *a b* in your Compaſſes, and putting one Foot in *c*, with the other cut the former Arch in *d*, a Line drawn thro' *c* and *d* is Parallel to the Line given.

Plate I. *Fig.* VI.

P R O B. VI.

With a Line given a b, *to make an Angle of any Number of Degrees given: Suppoſe* 45 *Degrees.*

Open your Compaſſes to 60 *deg.* of your Line of Chords (60 *deg.* of the Chords being equal to the Radius of that Circle, the Chords were deſign'd to meaſure) and putting one Foot in *a*, with the other deſcribe the Arch *c d*; then take 45 *deg.* from your Scale of Chords, and put it from *c* to *e* in the Arch, draw the Line *a e*, and 'tis done.

Plate I. *Fig.* VII.

Hence an Angle being already made, you may Meaſure its Quantity by taking *c e* in your Compaſſes, and applying it to your Line of Chords and it ſhews you the Number of *deg.* in that Arch, that is the Meaſure of the Angle.

PROB. VII.

Three Sides given to make a Triangle.

Plate I. *Fig.* VIII.

Let the Sides given be *a*, *b* and *c*, with which it is requir'd to make a Triangle, make *a b* = the Side *a*, then taking the Side *b* in your Compaſſes, with one Foot in *a* deſcribe an Arch, and with the Diſtance *c*, putting any Foot in *b*, cut the former Arch in *c*, then drawing *a c* and *b c* and 'tis done.

PROB. VIII.

To bring any three Points not ſituate in a Right-line, into the Circumference of a Circle.

Plate I. *Fig.* IX.

Let the three Points given be *a b c*, take above half the Diſtance between *a* and *b* in the Compaſſes, then placing one Foot of your Compaſſes in *a*, with the ſaid Diſtance deſcribe the Arch *e d*, with the ſame Diſtance and one Foot in *b* deſcribe the Arch *e d*, cutting the former in *e* and *d*, and draw the Line *e d*: Then taking above half the Diſtance between *b*, *c*, and one Foot being placed in *c* deſcribe the Arch *f*, *g*, and with the ſame Diſtance, one Foot being placed in the Point *b*, croſs the former Arch in the Points *f* and *g*, and draw the Line *f g*; now where the two Right-lines *d e* and *f g*, Interſect each other (*viz.* in the Point *h*) is the Center of the Circle, which was required.

DEFI-

DEFINITIONS.

1. A Circle is ſuppos'd to be divided into 360 equal Parts call'd Degres, and each Degree into 60 Parts call'd Minutes, and each Minute into 60 Parts call'd Seconds, &c. any Portion of which Circumference is call'd an Arch, and is Meaſur'd by the Number of Degrees, it contains.

Plate I. *Fig.* X.

2. A Chord is a Right-line joyning the Extremities of an Arch, as A C is the Chord of the Arches A B C, A D C.

3. A Right-ſine is a Right-line drawn from one end of an Arch, Perpendicular to that Diameter paſſing thro' the other end; or it is half the Chord of twice the Arch, A E is the Right-line of the Arches A B, A D, and here 'tis evident, that the Sine of 90 *deg.* (which is equal to the Radius or Semidiameter of the Circle) is the greateſt of all Sines, the Sine of an Arch greater than a Quadrant, being leſs than the Radius.

4. A Verſed-ſine is the Segment of the Diameter intercepted between the Arch and its Right-ſine, E B is the Verſed-ſine of the Arch A B, and E D of the Arch A D.

5. A Tangent of an Arch is a Right-line drawn Perpendicular to the end of a Diameter, paſſing thro' one end of an Arch, and its Length is Limited by a Right-line drawn from the Center thro' the other end of the Arch, and this Line is call'd the Secant; thus B M is the Tangent and F M the Secant of the Arches A B, A D.

6. The difference of an Arch from a Quadrant, whether it be greater or leſs is call'd its Complement, G A is the Complement of the Arches A B, A D; H A is the

Sine of that Complement or Co-ſine, G I the Tangent of that Complement, or Co-tangent, F I the Secant of that Complement or Co-ſecant.

7. The difference of an Arch from a Semicircle is call'd its Suppliment.

8. That Part of the Radius which is betwixt the Center and Right-ſine is = to the Co-ſine, F E = H A.

9. If an Arch be greater or leſſer than a Quadrant the $\left\{\begin{matrix}\text{Sum}\\ \text{Diff.}\end{matrix}\right\}$ of the Radius and Co-ſine is equal to the Verſed-ſine. Theſe things will be farther Illuſtrated by the following Figure.

In a Triangle are ſix Parts, *viz.* three Sides and three Angles, any three of which being given (except the three Angles of a plane Triangle) the other three may be found, either *Mechanically* by the help of a Scale of equal Parts and Line of Chords, or by an *Arithmetick* Calculation (if ſuppoſing the Radius divided into any Number of equal Parts, we know how many of thoſe equal Parts are in the Sine, Tangent or Secant of any Arch propos'd) the Art of inferring which is call'd *Trigonometry*, and is either Plane or Sphærical.

The Table of Natural Sines, Tangents, &c. *may be thus made,*

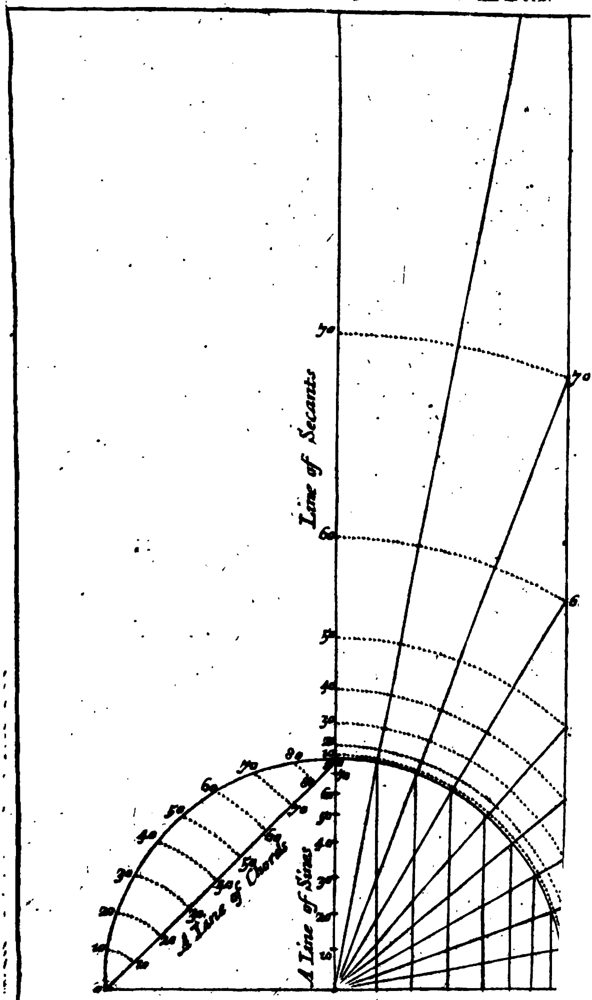
1. A E the Sine of an Arch being given to find its Co-ſine H A.

$FAq = AEq + FEq$, therefore $\sqrt{FAq - AEq} = FE = HA$, or $\sqrt{Rq - Sq} = \Sigma$.

2. A E the Sine of an Arch being given, to find B N the Sine of $\frac{1}{2}$ the Arch.

F E the Co-ſine is known (by the firſt) and conſequently E B; then $\sqrt{AEq + EBq} = AB$, and $\frac{1}{2}AB = BN$ *i.e.* $\frac{1}{2}\sqrt{Sq - Vq} = S\,\frac{1}{2}$ Arch.

3. B N


Line of Secants
A Line of Chords
A Line of Sines

Page 6.

3. B N the Sine of an Arch being given, to find A E the Sine of twice that Arch.

F N the Co-ſine is known (by the firſt) and the Triangles F B N, A B E are Similar; therefore $FB, FN :: AB . AE$. *i. e.* $R . \Sigma :: 2S . S\,2$ Arch.

4. βo and xP, the Sines of two Arches βD, $x\beta$ being given; to find $x\phi$ the Sine of the Sum of the Arches.

The Co-ſines F O. F P are known (*per* firſt) then $F\beta . FP :: \beta o . Pr$. and the Triangles yPx (Pux, $\phi u F$) $o\beta F$ are Similar, therefore $F\beta . Fo :: xP . xy$. then

$$xy + Pr = x\phi = \frac{Fo \times xP + FP \times \beta o}{F\beta}$$

that is the Sine of the one Arch into the others Co-ſine + Sine of the other Arch into the Co-ſine of the firſt Arch, and this Sum divided by the Radius = S of the Sum of two Arches; and if the Sines of the ſame two Arches were given, and it were requir'd to find the Sine of their Difference, it would be

$$\frac{Fo \times xP \backsim FP \times \beta o}{R} = \text{S. of the}$$

difference of two Arches.

5. Suppoſe the Arch $L, a = 30$ *deg.* and $ab = ab$, and $b\omega$ the Sine of bL, and bK its Co-ſine, alſo bd the Sine of bL, and br its Co-ſine; draw Fa cutting bb in g, then $4gbq$ $(4eb,q) = bb,q = be,q + eb,q$; therefore $3gb,q = be,q$; and $gb \times \sqrt{3} = be$, that is $gb \times 1.732050807 = be$; and $b\omega + gb \times 1.732050807 = bd$, *i. e.* the Sine of an Arch leſs than 30 *deg.* adding $\sqrt{3} \times$S of the Defect, makes the Sine of an Arch as much exceeding 30 *deg.* therefore if the Sines of all Arches leſs than 30 *deg.* be known, the reſt as far as 60 *deg.* may be had by one Addition, and a Multiplication into the Root of 3.

6. The Triangles *gbf* and *beb* are Similar, but the Angle *bfg* = *g* F L = 30 *deg.* therefore the Angle *bbe* = 30 *deg.* and ſuppoſing a Circle on the Center *g*, deſcribed through *beb*, *be* the Chord of 60 will be equal to *bg* the Radius therefore, *rb* + *hg* = K *b*, *i. e.* the Sine of any Arch *b D* leſs than 60 *deg.* adding the Sine of the Defect *be*, make K *b* the Sine of an Arch as much exceeding 60 *deg.*

Conſequently, the Sines of all Arches leſs than 60 *deg.* being known, the reſt to 90 *deg.* may be found by one Addition. For inſtance.

S, 58 *deg.* + S, 2 *deg.* = S, 62 *deg.*
S, 50 *deg.* + S, 10 *deg.* = S, 70 *deg.*

An Application of what has been ſaid, to the actual making the aforeſaid Table.

The Radius is equal to the Chord of 60 *deg.* and $\frac{1}{2}$ R = S, 30. then by the Second are known the Sines of the $\frac{1}{2}$ Arches.

deg.	′	″	‴	iv	v
15	00	00	00	00	00
7	30	00	00	00	00
3	45	00	00	00	00
1	52	30	00	00	00
	56	15	00	00	00
	28	07	30	00	00
	14	03	43	00	00
	07	01	52	30	00
	03	30	56	15	00
	01	45	28	07	30
		52	44	03	45

So that by 12 Diviſions we come to Sines, which have the ſame ſenſible Proportion as their Arches, for the laſt Sine ſave one, is double of the laſt Sine to all Senſe, as one Arch is double of the other.

Now the Number of Minutes in 30 *deg.* is 1800; and $\overset{\prime\prime}{52}.\ \overset{\prime\prime\prime}{44}.\ \overset{iv}{03}.\ \overset{v}{45}.$ is contain'd in 1800 Minutes 2048 times, therefore $\overset{\prime}{1}. \times 1800 = 2048 \times \overset{\prime\prime}{52}.\ \overset{\prime\prime\prime}{44}.\ \overset{iv}{03}.\ \overset{v}{45}.$ therefore 1800. 2048 :: Arch $\overset{\prime\prime}{52}.\ \overset{\prime\prime\prime}{44}.\ \overset{iv}{03}.\ \overset{v}{45}.$ Arch $\overset{\prime}{1}.$ :: S, $\overset{\prime\prime}{52}.\ \overset{\prime\prime\prime}{44}.\ \overset{iv}{03}.\ \overset{v}{45}.$ S $\overset{\prime}{1}.$

And thus by a continued Biſſection of Arches, the Sine of one Minute being had (by the 3) is found the Sine of two Minutes, then (by the 4) the Sine of three Minutes, and ſo to 30 *deg.* then (by the 5) to 60 *deg.* and (by the 6) the reſt to 90 *deg.*

Having found the Sines, the Tangents and Secants may be found by the following Proportions.

$$\left.\begin{array}{l} FE.\ FB :: EA.\ BM \\ FE.\ FB :: FA.\ FM \\ BM.\ BF :: FG.\ GI \end{array}\right\}\text{that is}\left\{\begin{array}{l} \Sigma.\ R :: S.\ T. \\ \Sigma.\ R :: R.\ ſ. \\ T.\ R :: R.\ \tau. \end{array}\right.$$

LEM. I.

$$\tfrac{1}{2} V \times R = S\,q\,\tfrac{1}{2}\,\text{Arch} = \tfrac{1}{2}\,S\,\text{Arch} \times T\,\tfrac{1}{2}\,\text{Arch}.$$

1. $EB.BN :: AB.\ FB :: (\tfrac{1}{2} AB.)\ BN.\ \tfrac{1}{2} FB.$

i. e. $V.\ S.\ \tfrac{1}{2}\,\text{Arch} :: S.\ \tfrac{1}{2}\,\text{Arch}.\ \tfrac{1}{2} R.$ therefore $\tfrac{1}{2} VR = S\,q\,\tfrac{1}{2}\,\text{Arch}.$

2. $\tfrac{1}{2} AE.BN :: \tfrac{1}{2} AE.AB :: BN.\ B\lambda.$ therefore $\tfrac{1}{2} AE \times B\lambda = S\,q\,\tfrac{1}{2}\,\text{Arch} = \tfrac{1}{2}\,S\,\text{Arch} \times T\,\tfrac{1}{2}\,\text{Arch}.$

LEM. II.

$$\tfrac{1}{2} R\,v = \Sigma\,q\,\tfrac{1}{2}\,\text{Arch} = \tfrac{1}{2}\,S\,\text{Arch} \times \tau\,\tfrac{1}{2}\,\text{Arch}.$$

1. $\tfrac{1}{2} ED.FN :: (ED.\ AD :: AE.\ AB ::)\ FN.\ FB,$ therefore $\tfrac{1}{2} ED \times FB = FN\,q,$ that is $\tfrac{1}{2} R\,v = \Sigma\,q\,\tfrac{1}{2}$ Arch.

2. FG.Gz :: AE.ED, therefore $\frac{1}{2}$AE×Gz = $\frac{1}{2}$ ED×FG = FNq. = $\frac{1}{2}$S Arch × τ $\frac{1}{2}$ Arch.

LEM. III.

The Tangents of two Arches A *and* B, *are reciprocally proportional to their Co-tangents.*

for T,A. R :: R. τ,A
and T,B. R :: R. τ,B

---

therefore T,A. × τ A = T,B × τ B
therefore T,A. TB :: τ B τ A.

LEM. IV.

The Co-ſines of two Arches A *and* B, *are reciprocally Proportional to their Secants.*

Σ A. R :: R. ſ. A
Σ B. R :: R. ſ. B.

---

therefore Σ A × ſ A = Σ B × ſ, B
therefore Σ A Σ B :: ſ, B ſ, A.

Plane and Sphærical Trigonometry are ſolved by the help of four Fundamental Propoſitions call'd Axioms.

AXIOM I.

For Plane Trigonometry.

In a Right-angled Triangle, if one Leg of the Right-angle, be made the Radius of a Circle, then ſhall the other Leg be the Tangent of the Angle oppoſite to it, and the Hypothenuſe (or ſide oppoſite to the Right-angle) its Secant.

But

Fig: I.

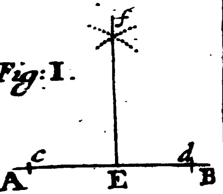


Fig: II.

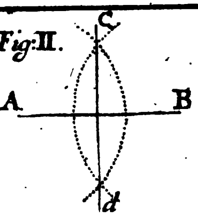


Fig: III.

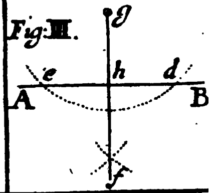


Fig: IIII.

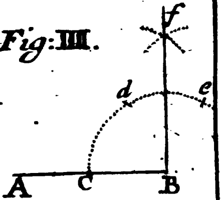


Fig: V.

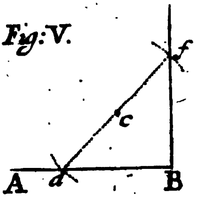


Fig: VI.

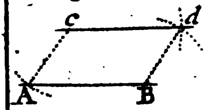


Fig: VII.

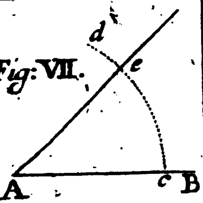


Fig: VIII.

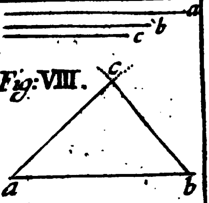


Fig: IX

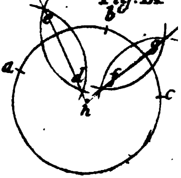


Fig: X.

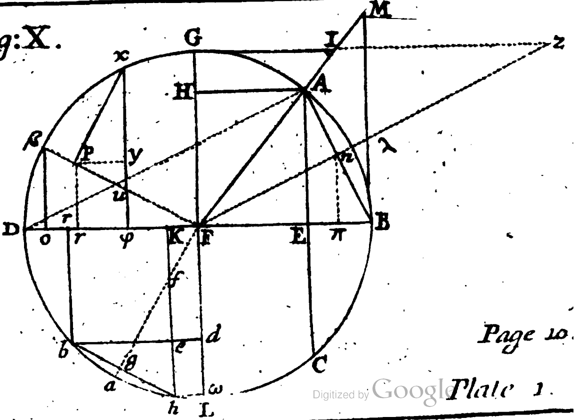


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Plate 1.

But if the Hypothenuſe be made the Radius of a Circle, then will the Legs (or Sides including the Right-angle) be the Sines of the Angles oppoſite, which will be evident by the Figure.

Upon this Axiom depends the Solution of the 7 Caſes of Right-angled Triangles.

And in the following Proportions, I ſuppoſe that two Lines eſtimated in parts of any Meaſure.

For *Example*, in parts of the Table, are Proportional to themſelves reckon'd accoring to any other Meaſure; ſo A B reckon'd as Radius, of parts 100000, is to B C the Tangent of the Angle A 30 *deg*. of Tabular parts 57735; ſo the ſame A B of 213 Feet, to B C 123 Feet almoſt.

Plate II. *Fig*. I.

Note, That the three Angles of a Triangle make 2 ⌋ or 180 *deg*. and therefore in a Right-angled Triangle, one of the acute Angles is the Complement of the other to 90 *deg*. conſequently one being given, the other is known; and in an Oblique-angled Triangle, two Angles being given; the third is alſo known as being the Suppliment or Reſidue of the Sum of the other two, to 180 *deg*.

For the more eaſie making the Proportions for the Solutions of Right-angled Triangles

Obſerve, That as different Sides are made Radius, So the other Sides acquire different Names: Which Names are either Sines, Tangents or Secants, And are to be taken out of your Table.

To find a Side, any Side may be made Radius.

Then ſay,

As the Name of the Side given,
  Is to the Name of the Side requir'd.
So is the Side given,
  To the Side required.

But to find an Angle, one of the given Sides muſt be made Radius.

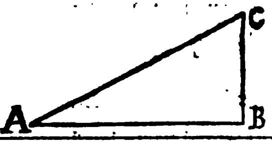
Then,

As the Side made Radius,
Is to the other Side:
So is the Name of the firſt Side,
(Which is Rad.) to the Name of the ſecond Side.

Which fourth Proportional muſt be found among the Sines or Tangents, &c. to be Determin'd by the Side made Radius, and againſt it is the Angle requir'd.

The

The Proportions for the Solution of the 7 Caſes of Plane Right-angled Triangles.



Given	Req	Proportions.	Rad	Caſe.
A B A & C	B C	Σ A. S, A :: A B. B C R. T, A :: A B. B C τ A. R :: A B. B C	A C A B B C	1
AB A & C	A C	Σ A. R :: A B. A C R. ſ, A :: A B. A C τ A, σ A :: A B. A C	AC A B BC	2
AB BC	A & C	A B. B C :: R. T, A Complement is C. B C. A B :: R. T, C Complement is A.	A B BC	3
AB BC	A C	A B. B C :: R. T, A then, Σ A. R :: A B. A C or $\surd : ABq + BCq = AC$	A B AC	4
AB AC	A & C	A C. A B :: R. Σ A A B. A C :: R. ſ. A	AC AB	5
AB AC	B C	A C. A B :: R. Σ A then, R, T, A :: A B. B C or $\surd : ACq - ABq = BC$	AC AB	6
AC A C	AB	R. Σ, A :: A C. A B ſ, A. R :: A C. A B σ A. τ A :: A C. A B	AC AB BC	7

EXAMPLES.

Caſe 1. given AB. 56 *parts*
L, A. 30 *deg.* } Req. BC.
L, B. 60 *deg.*

1. *Geometrically with Scale and Compaſſes.*

From a Scale of equal Parts lay down the Line AB = 56, Erect the Perpendicular thereto BC, at the Point A make the Angle BAC = 30 *deg.* produce the Line AC till it meet the Perpendicular BC in C, and the Triangle is determin'd, and the Line BC being Meaſur'd by the ſame Scale by which you Plotted, AB will give its Length.

Plate II.
Fig. II.

2. *By the Table of Natural Sines, Tangents*, &c.

R. T,A :: AB. BC.
(*i.e.*) 10000000. 5773503 :: 56.
56

34641018
28867515

32.3316168 that is 32,3316, &c. = BC.

which is found by Multiplying the 2d and 3d Terms into one another, and dividing the Product by the firſt.

To avoid Prolixity I ſhall give no more Solutions by the Table of Natural Sines, *&c.*

3. *By the Canon of Artificial Sines*, &c. *and Logarithm Numbers.*

RULE.

Add the Logarithms of the 2d and 3d Term together, from that Sum Subſtract the Logarithm of the firſt

Term, the remainder ſhall be the Logarithm of the 4th Term required.

By LOGARITHMS.

T. 30 *deg.* 9.7614394
56. 1.7481880

Sum 11.5096274
Subſt. Rad. 10.0000000

Rem. 1.5096274 the Logarithm of 32.33 = BC.

Caſe 2. given AB = 56 *parts*, ∠ A. 30 *deg.*, ∠ B. 60 *deg.* } To find AC.

1. *Geometrically.*

The Triangle being Conſtructed as before, Meaſure AC by the Scale you Plotted AB by, and you have its Length. *Plate* II. *Fig.* III.

2. *By Logarithms.*

ΣA. R :: AB. AC.

R. 10.0000000
AB. 1.7481880

Sum 11.7481880
Subſt. ΣA. 9.9353204

Rem. 1.8128676 the Logarithm of 64.99 = AC.

Caſe 3. given AB = 60, BC = 35 } parts, to find ∠∠ A & C.

1. *Geome-*

1. *Geometrically.*

Plate II. *Fig.* IV.

Draw the Line A B, and put 60 parts from A to B upon the Point B, let there be the Perpendicular Erected B C, lay off 35 parts from B to C, then draw the Line A C, and Meaſure the Angles A and C by the Line of Chords.

2. *By Logarithms.*

A B . B C : : R , T , A.

B C. 1.5440680
R. 10.0000000

Sum 11.5440680
Subſt. A B. 1.7781512

Rem. 9.7659168 which is the Logarithm Tangent of 30 *deg.* 15 *min.* the Angle; the Complement of which 59.45 is the Angle C.

Caſe 4. given A B = 60, B C = 35 parts to find A C.

1. *Geometrically.*

Plate II. *Fig.* V.

The Triangle being Conſtructed, as in the former Caſe, Meaſure A C by your Scale of equal parts and 'tis done.

2. *By Logarithms.*

Find by the laſt Caſe the Angle A.
Then by the ſecond Caſe find A C.

Caſe 5. given A B = 80, A C = 100 parts, to find A and C.

1. *Geometrically.*

Draw the Line A B putting thereon 80 parts from A to B, upon the Point B to the Line A B erect the Perpendicular B C, open your Compaſſes to the diſtance of 100 equal parts, and putting one Foot in A, with the other croſs the Line B C in C, then draw A C, and Meaſure the Angles A and C by your Line of Chords.

Plate II. *Fig.* VI.

2. *By Logarithms.*

A C. A B :: R. ≩ A.

AB 1.9030900
R. 10.0000000

Sum 11.9030900
Subſt. A C 2.0000000

Rem. 9.9030900 the Logarithm Co-ſine of 36 *deg.* 52 *min.*

Caſe 6. given $\left.\begin{array}{l} AB = 80 \\ AC = 100 \end{array}\right\}$ parts, To find B C.

1. *Geometrically.*

The conſtruction being the ſame as in the laſt, therefore; Meaſure B C by your Scale of equal parts.

Plate II. *Fig.* VII.

2. *By Logarithms.*

By the laſt Caſe find the Angle A:
Then by the 1. Caſe having the Angle A and A B, Given, find B C.

Caſe 7. given $\left.\begin{array}{l} AC = 50\ \textit{parts} \\ \angle A = 35\ \textit{deg.} \\ \angle C = 55\ \textit{deg.} \end{array}\right\}$ To find A B.

1. *Geometrically.*

Draw the Indeterminate Right-line A B, at any Point A draw the Right-line A C, making the Angle B A C = 35 *deg.* put 50 *parts* from A to C, from C let fall the Perpendicular C B to the Line A B, cutting A B in B, A B Meaſur'd by your Scale of equal Parts anſwers the Queſtion.

Plate II.
Fig. VIII.

2. *By Logarithms.*

R. ≩ A :: A C. A B.

≩ A. 9.9133645
A C. 1.6989700

Sum. 11.6123345
Subſt. R. 10.0000000

Rem. 1.6123345 the Logarithm of 40.95 parts. = A B.

Note, all theſe Caſes may eaſily be workt by the Gunters Scale, whereon is a Line of Logarithm Numbers, Logarithm Sines, and Logarithm-Tangents.

RULE.

Extend your Compaſſes on this Rule from the firſt Term to the ſecond Term in the Proportion, and the ſame extent will reach from the third Term to the fourth Term requir'd.

Only obſerve that if your ſecond Term be $\left\{\begin{matrix}\text{greater}\\ \text{leſs}\end{matrix}\right\}$ than the firſt, the fourth Term muſt be $\left\{\begin{matrix}\text{greater}\\ \text{leſs}\end{matrix}\right\}$ than the third, and therefore when your Compaſſes are placed on the third Term, extend them that way the Number muſt be greater or leſs as this Rule directs.

Plate 2.

Fig: I.

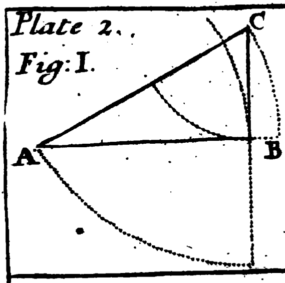


Fig: II.

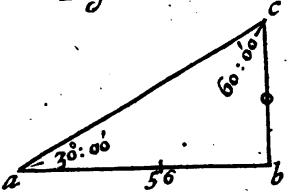


Fig: III.

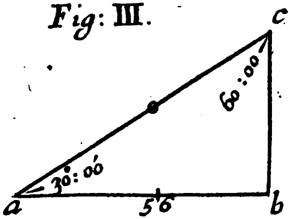


Fig: IIII.

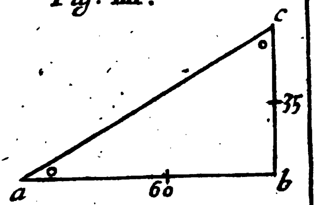


Fig: V.

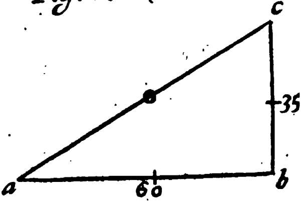


Fig: VI.

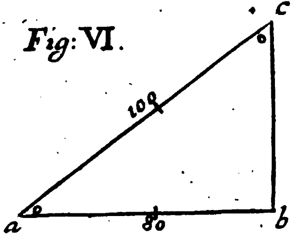


Fig: VII.

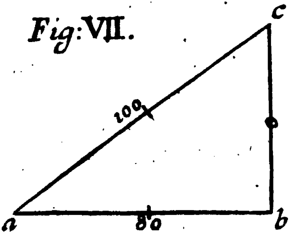
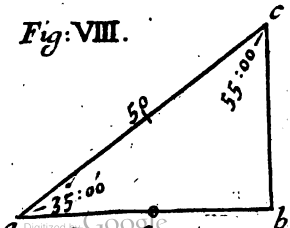


Fig: VIII.



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Example in the 1. Caſe

Where the Proportion is R. T, A :: A B. B C.

Extend your Compaſſes from the Radius of the Tangents (which is the Tangent of 45 *deg.*) to the Tangent of the Angle A, &c. 30 *deg.* the ſame Extent of the Compaſſes will reach from the third Term A B = 56 *parts*, to 32. 33 *parts* = B C required.

Example in the 2. Caſe.

The Proportion is Σ A. R :: A B. A C.

Extend your Compaſſes from the Co-ſine of A, which is the Sine of 60 *deg.* to the Radius of the Sines (which is the Sine of 90 *deg.*) the ſame Extent will reach from the third Term A B 56 *parts*, to the fourth Term A C = 64. 99 *parts.*

After the ſame way you may work them all by your Gunters Scale.

A X I O M II.

Of Oblique Plane Triangles.

In any Triangle, the Sides are Proportional to the Sines of the Angles Oppoſite.

D E M O N S T R A T I O N.

Produce the leſſer Side A B to F, making A F = B C; let fall the Perpendiculars F E, B D upon the Side A C produced if need be, then will F E be the Sine of the Angle A, and B D the Sine of the Angle C to the Radius B C = A F. Now the Triangles A B D, A F E are Similar

Plate III.
Fig. I and II.

Similar; therefore AF (BC) AB :: FE. BD that is :: S, A. S. C, Q. E. D.

Otherwiſe thus, AB. R :: BD. S, A
and BC. R :: BD. S, C

therefore AB x S, A = BC x S, C
therefore AB. BC :: S, C. S, A Q. E. D.

AXIOM III.

The Sum of the Legs of an Angle is to their difference, as the Tangent of $\frac{1}{2}$ the Sum of the Angles oppoſite to thoſe Legs, to the Tangent of half their Difference,

DEMONSTRATION.

In the Triangle ABC, make BD = BA, and draw the Line AD, let fall the Perpendicular BF *Plate* III. *Fig.* III. upon the Line AD which will Biſſect AD in F, draw FE Parallel to AC, which will Biſſect DC, the Difference of the Legs in E, the Angle BAF is $\frac{1}{2}$ the Sum of the Angles BAC and C, and FAG $\frac{1}{2}$ their Difference, now if AF be Radius, BF will be the Tangent of $\frac{1}{2}$ the Sum & FG of the $\frac{1}{2}$ Difference. Now the Triangle BGC is cut Proportionably by the Line FE.

therefore BE. EC :: BF. FG.
or 2BE. 2EC :: BF. FG.

That is,

As the Sum of the 2 Sides to their Difference,
So is the Tangent of $\frac{1}{2}$ the Sum of the Angles oppoſit to thoſe Sides,
To the Tangent of $\frac{1}{2}$ their Difference,
Q. E. D.

Or

Or thus,

Upon B with the Diſtance BC deſcribe the Circle BCED, Produce AB to E and D, and CA to G, draw DC, and AF Parallel to DC, draw likewiſe CE.

'Tis *Plain* that AE is the Sum of the 2 Sides AB, BC, and AD, their Difference, the Angle BAF is ½ the Sum of the Angles oppoſit to thoſe Sides, and the Angle FAC ½ their Difference.

Plate III. *Fig.* IV.

Now the Angle DCE in a Semicircle is Right = AFC, and therefore if AF be Radius, FE will be the Tangent of the ½ Sum of the Angles, and FC the Tangent of the ½ Difference.

Now the Triangle EDC is cut Proportionably by the Line AF. Therefore AE. AD : : EF. FC. Q. E. D.

AXIOM IV.

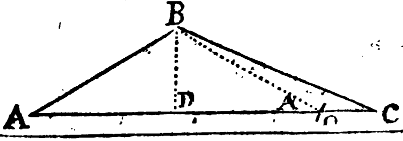
Having drawn a Perpendicular BH from an Angle to its oppoſit Baſe, the Baſe AC ſhall be to the Sum of the other two Sides AE, as their Difference DA is to the Difference of the Segments of the Baſe GA.

DEMONSTRATION.

For by the 35 Propoſition of the third of *Euclide*, the Rectangle under AD, AE is equal to the Rectangle under GA and AC.

Therefore AC. AE : : DA. GA. Q. E. D.

The Proportions for the Solutions of the 6 Caſes in Oblique Plane Triangles.



Given	Req	Proportions,	Axi.	Caſe.
A B B C & C	A	A B. B C : : S, C. S, A	2	1
AB B C & C	A C	A B. B C : : S, C. S, A Hence by Subſtraction the Angle B will be known. S, A. S, B : : B C. A C	2	2
A C B C	A B	S, A. S, C : : B C. A B	2	3
B A B B C	A & C	B C $+$ A B. B C $-$ A B : : T $\frac{1}{2}$ Z *L L* oppoſit. T $\frac{1}{2}$ X *L L*, op. then, $\frac{1}{2}$ Z $+$ $\frac{1}{2}$ X $=$ greater *L*, A $\frac{1}{2}$ Z $-$ $\frac{1}{2}$ X $=$ leſſer *L*, C	3	4
B A B B C	A C	1. find the Angles by the laſt then S, C. S, B : : A B. A C	3	5
A B B C A C	A B C	A C. B C $+$ B A : : B C $-$ B A. O C then $\frac{1}{2}$ A C $+$ $\frac{1}{2}$ O C $=$ D C $\frac{1}{2}$ A C $-$ $\frac{1}{2}$ O C $=$ D A then A B. A D : : R. Σ A. & C B. D C : : R. Σ C.	4	6

Examples in the Caſes of Oblique Triangles.

Caſe I. given $\left.\begin{array}{l}AB=30\\ BC=40\\ \angle C=25\,d.\ 30'\end{array}\right\}$ To find the Angle A.

1. *Geometrically.*

Draw the Line CA, produced as far as neceſſary: At the Point C make the Angle A C *B*= 25 *deg.* 30 *min.* ſet off 40 parts from C to *B*, take 30 parts in your Compaſſes from the ſame Scale, and putting one point in *B*, croſs the Line CA, with the other, which it will do in two points A and A. Draw the Lines B A, B A; then the Angles C A B, C A B, being meaſured by a Line of Chords, will give the Anſwer. And here 'tis manifeſt, that the Angle A, in the one Caſe is Obtuſe, in the other Acute.

Plate III. *Fig.* V.

But here Note, That if the given Angle be Obtuſe, the Angle required is Acute. But if Acute, and oppoſite to the $\left\{\begin{array}{l}\text{greater}\\ \text{leſſer}\end{array}\right\}$ ſide the Angle required is $\left\{\begin{array}{l}\text{Acute,}\\ \text{Doubtful}\end{array}\right\}$ and whether Acute or Obtuſe muſt be Determin'd before the Opperations.

2. *To do this by the Canon of Artificial or Logarithmick Sines.*

Obſerve, That it has been demonſtrated in the *ſecond* Axiom, that the Sides have ſuch Proportion one to another, as the Sines of the Angles oppoſite.

Therefore, *Firſt*,

As the Sine of any one Angle,
Is to the Sine of any other Angle;
So is the Side oppoſite to the firſt Angle,
To the Side oppoſite to the ſecond Angle.

Secondly,

As any one Side,
Is to another Side;
So is the Sine of the Angle oppoſite to the firſt Side,
To the Sine of the Angle oppoſite to the ſecond Side.

Therefore, If you would find a Side, begin your Proportion with the Sine of an Angle; and if you would find an Angle, begin with a Side.

A B. B C :: S, C, S, A.

B C. 1. 6020600
S, C. 9. 6339844

Sum. 11. 2360444
A B. ſubſt. 1. 4771212

9. 7589232

$$\text{the Sine of A}\begin{cases}35\,d.\ \ 2'\\144\ \ \ 58\end{cases}\text{if}\begin{cases}\text{Acute,}\\\text{Obtuſe.}\end{cases}$$

$$\text{Caſe 2. given}\ \left.\begin{matrix}AB = 30\\BC = 40\\C = 25\,d.\ 30'\end{matrix}\right\}\text{To find A C.}$$

1. *Geometrically.*

Plate III. *Fig.* VI. The Conſtruction is already ſhew'd; Therefore, meaſure A C, and you have what is deſir'd, that is the greater C A, if A be acute, the leſſer if the contrary.

2. *By the Canon of Logarithm Sines*, &c.

Find the Angle A by the laſt Caſe: For Inſtance A was found,

$$\left.\begin{matrix}35\,d.\ 2'\\144.\ 58\end{matrix}\right\}\text{if}\left\{\begin{matrix}\text{Acute,}\\\text{Obtuſe.}\end{matrix}\right\}\begin{matrix}\text{and conſequently}\\ABC =\end{matrix}\left\{\begin{matrix}119.\ 28\\9.\ 32\end{matrix}\right.$$

S, A. S, B :: BC. AC.

S, B. 9.9398396
BC. 1.6020600

Sum. 11.5418996
Subſt. S, A. 9.7589519

Rem. 1.7829477 60, 66 = AC if the Angle A be Acute.

S, B. 9.2191164
BC. 1.6020600

Sum. 11.8211764
Subſt. S, A. 9.7589519

1.0622245 11. 54 = AC if A be Obtuſe.

$$\text{Caſe 3. given, }\left.\begin{matrix}BC = 76\\A = 33.\ 15.1.\\C = 26.\ 3\end{matrix}\right\}\text{To find } AB.$$

1. *Geometrically.*

The Angles A and C being known, the Angle B muſt neceſſarily be known, *viz.* 120 *d.* 42′. Draw the Line CB, and thereon put 76 *pts.* from your Scale; from C to B, at the Point C make the Angle BCA = 26. 3′ and the An-

Plate III. *Fig.* VII.

gle CBA = 120. 42. the lines CA and BA will concur in A, and the Triangle is Determin'd, then if you Meaſure AB by your Scale, 'tis done.

2. *By Logarithms.*

S, A. S, C. :: BC. AB.

S, C. 9.6426182
B C. 1.8808136

Sum. 11.5234318
Subſt. S, A. 9.7390129

Rem. 1.7844189 the Logarithm of AB. 60. 87 *pts.*

Caſe 4. given BC = 75
BA = 50
B = 88 *d.* 00′
} To find the Angles A and C.

1. *Geometrically.*

Draw the Line BC and from your Scale put off 75 from B to C, then draw the Line BA making the Angle CBA = 88 *d.* 00′ and ſet off 50 *pts.* from B to A, and draw the Line AC and the Triangle is Determin'd. Then the Angles A and C may be Meaſur'd by a Line of Chords.

Plate III.
Fig. VIII.

2. By

2. By *Logarithms*.

BC + AB. BC — AB : : T $\frac{1}{2}$ Z L L op. T $\frac{1}{2}$ X L L's Op.
That is,
125. 25 : : T 46 *d.* T $\frac{1}{2}$ X L L's Op.

25.	1.3979400
T. 46 *d.*	10.0151628
Sum.	11.4131028
Subst. Log. 125.	2.0969100
Rem.	9.3161928 which is the Log. Tang. of $\frac{1}{2}$ the diff. of A and C = 11 *d.* 42′

Now $\frac{1}{2}$ the Sum of A & B 46 *d.* { + / — } $\frac{1}{2}$ the diff. 11. 42′ } = { 57 *d.* 42′ the Ang. A / 34 *d.* 18′ the Ang. C.

This hath been prov'd in the third Axiom.

Case the 5. Given, the same as before: *Plate* III.
To find the Side A C. *Fig.* IX.

The Angles A and C being found as in the last Case.

A = 57 *d.* 42′
C = 34 18

By *Logarithms*.

S, C. S, B : : AB. AC.

S, B.	9.9997354
A B.	1.6989700
Sum.	11.6987054
Subst. S, C.	9.7509146

1.9477914 the Logarithm of 88, 67 *pts.* = A C.

Case

Caſe 6. given AB = 68 }
BC = 120 } To find the Angles A, C, B.
AC = 156 }

1. *Geometrically.*

Plate III. *Fig.* X. With the 3 Lines AC, CB, BA make the Triangle ABC, then by the help of a Line of Chords Meaſure the Angles requir'd.

2. By *Logarithms.*

AC. BC + BA :: BC — BA. OC the difference of the Segments of the Baſe.

That is,

156. 188 :: 52. OC.

188	2.2741578
52	1.7160033
Sum	3.9901611
Subſt. 156.	2.1931246
Rem.	1.7970365 = 62.67 = OC the difference of the Segments.

Then, ½ AC + ½ OC = DC = 109.33
— = DA = 46.67

Now the Oblique Triangle ABC is by the Perpendicular BD divided into two Right-angled Triangles BDC, BDA, in each of which the Hypothenuſe and Baſe is given: Therefore by the 5 Caſe.

AB. AD :: R. Σ A }
BC. DC :: R. Σ C } by the 5 Caſe.

The Operation of which I ſhall leave to the Learner to avoid Prolixity.

Plate: 3.

Fig: I.

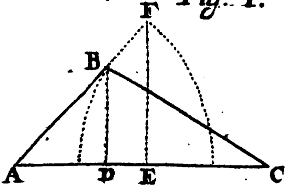


Fig. II.

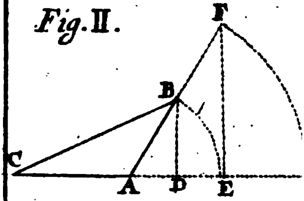


Fig: III.

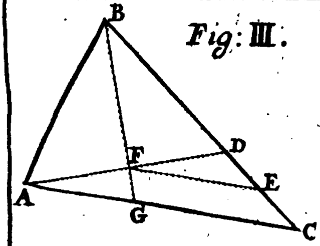


Fig. IIII.

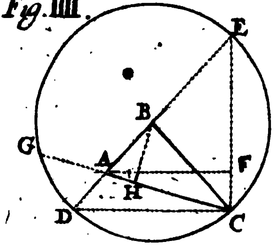


Fig. V.

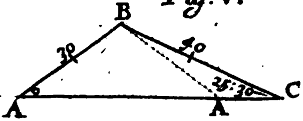


Fig. VI.

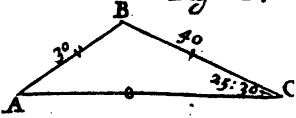


Fig: VII.

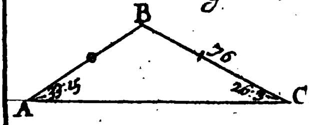


Fig: VIII.

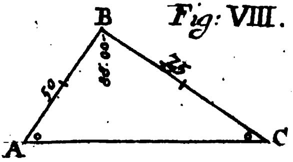


Fig: IX.

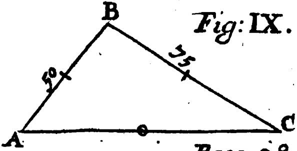
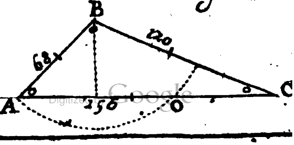


Fig: X.



This laſt Caſe may be Solved by four other Theorems.

For the Analyſis and Demonſtration whereof; Suppoſe m, n, the Legs of the Angle required b its Baſe a, $n \backsim a$ the Segments of the Baſe made by p, a Perpendicular let fall from another Angle, whether it fall within or without the Triangle.

Plate IV. *Fig* I. and II,

$$z = m + n$$
$$x = m - n$$
$$\mathfrak{z} = \frac{m + n + b}{2}$$

Then $mm - aa = pp = bb - nn - aa + 2na$, theref. $a = \frac{mm + nn - bb.}{2n}$

therefore $R.\,\Sigma :: m.\,\frac{mm + nn - bb}{2n} :: 2mn.\,mm + nn - bb :: 2mn.\,(2mn \pm mm \pm nn \mp bb) \begin{array}{l} zz - bb \\ = bb - xx \end{array}$

compounding and dividing $:: R.\,R \pm \Sigma = \frac{v}{V}$ by def, $:: \frac{1}{2}Rq.\, \left.\begin{array}{l} \frac{1}{2}R\,v \\ \frac{1}{2}R\,V \end{array}\right\} = \left\{\begin{array}{l} \Sigma q\,\frac{1}{2}\,\text{Ang.} \\ S q\,\frac{1}{2}\,\text{Ang.} \end{array}\right\}$ by the 2d Lemma, by the 1ſt Lemma,

Therefore $4mn.\,Rq :: \left\{\begin{array}{l} zz - bb \\ bb - xx \end{array}\right\}$ to $\left\{\begin{array}{l} \Sigma q\,\frac{1}{2}\,\text{Angle} \\ S q\,\frac{1}{2}\,\text{Angle.} \end{array}\right.$

and $zz - bb.\,bb - xx :: \Sigma q\,\frac{1}{2}$ Angle. $S q\,\frac{1}{2}$ Angle $::$ $Rq.\,Tq\,\frac{1}{2}$ Angle $:: \pi.\,q\,\frac{1}{2}$ Angle Rq. this will be Evident by the 3d Lemma, and becauſe $\Sigma.\,S :: R.\,T.$

Therefore,

$$1.\ 4mn . \overline{z+b} \times \overline{z-b} :: Rq . \Sigma q \tfrac{1}{2} \text{ Angle.}$$

or dividing the 1ſt and 2d Term by 4

$$mn . \overline{\tfrac{z}{2}} \times \overline{\tfrac{z}{2}-b} :: Rq . \Sigma q \tfrac{1}{2} \text{ Angle.}$$

in Words thus,

As the Rectangle of the Sides including the Angle
required,
Is to the Rectangle of ½ the Sum of the 3 Sides
Multiplied by ½ the Sum of the 3 Sides made
leſs by the Baſe.
So is the Square of the Radius,
To the Square of the Co-ſine of ½ the Angle
required.

$$2.\ 4mn . \overline{b+x} \times \overline{b-x} :: Rq . Sq, \tfrac{1}{2} \text{ Angle.}$$

Or as before,

$$mn . \overline{\tfrac{z}{2}-m} \times \overline{\tfrac{z}{2}-n} :: Rq . Sq \tfrac{1}{2} \text{ Angle.}$$

In Words thus,

As the Rectangle of the Sides including the Angle
required,
Is to the Rectangle of ½ the Sum of the 3 Sides,
made leſs by one of the Sides including the
Angle, Multiplied by ½ the Sum of the 3 Sides
made leſs by the other Side including the
Angle requir'd:
So is the Square of the Radius;
To the Square of the Sine of ½ the Angle required,

3. z + b

$$3.\ \overline{z+b}\times\overline{z-b}.\overline{b+x}\times\overline{b-x}::Rq.Tq\tfrac{1}{2}\text{ Angle.}$$

Or,

$$z\times z-b.\overline{z-m}\times\overline{z-n}::Rq.Tq.\tfrac{1}{2}\text{ Angle.}$$

In Words thus,

As ½ the Sum of the Sides multiplied by ½ the Sum of the ſides made leſs by the Baſe,
Is to half the Sum of the 3 Sides, made leſs by one of the including Sides, multiplied by ½ the Sum of the 3 Sides made leſs by the other including Side:
So is the Square of the Radius,
To the Square of the Tangent of ½ the Angle requir'd.

$$4.\ \overline{b+x}\times\overline{b-x}:\overline{z+b}\times\overline{z-b}::Rq:\tau q.\tfrac{1}{2}\text{ Angle.}$$

Or,

$$\overline{z-m}\times\overline{z-n}.z\times z-b::Rq.\tau q\tfrac{1}{2}\text{ Angle.}$$

In Words thus,

As ½ the Sum of the 3 Sides made leſs by one of the including Sides, Multiplied by ½ the Sum of the three ſides made leſs by the other including Side;
Is to ½ the Sum of the 3 Sides Multiplied by ½ the Sum of the 3 Sides made leſs by the Baſe,
So is the Square of the Radius,
To the Square of the Co-tangent of ½ the Angle required.

Now $zz - xx = 4mn$,
For $\frac{1}{2}z + \frac{1}{2}x = m$
$\frac{1}{2}z - \frac{1}{2}x = n$
therefore $\frac{1}{4}zz - \frac{1}{4}xx = mn$
and Conſeq. $zz - xx = 4mn$.

If therefore you have an Angle given, with its Baſe, and the Sum or Difference of the Legs, you'll have by theſe Theorems the Square of the Sum or Difference, and ſo both Sum and Difference, and Conſequently the very Legs.

For inſtance, in the firſt Caſe if the Angle included between the Sides *m* and *n* were given together with z the Sum of *m* and *n*, then the 2d, 3d and 4th Terms are abſolutely known, and Conſequently the 1 Term $4mn$, is known, if from zz I Subſtract $4mn$ the remainder is xx the Square of the difference, then

$\frac{1}{2}z + \frac{1}{2}x$ greater Side,
$\frac{1}{2}z - \frac{1}{2}x$ leſſer Side.

Spheric Trigonometry.

A *Spheric Triangle*, is that which is contain'd between the Arches of 3 great Circles of the Sphere.

A *Spheric Angle* is the ſame with the inclination of the Planes of thoſe two Circles which conſtitute the Angle.

Affections of Spheric Triangles.

1. When a Circle falls on another Circle, the Sum of the two Angles made thereby is = 2 ∟.

2. When a Circle croſſes a Circle, the Vertical Angles made thereby are mutually Equal.

3. The greater Angle is oppoſed to the greater Side:

4. An Iſoſceles Triangle hath its two Angles at the Baſe mutually Equal; and on the contrary, if a Triangle has 2 Angles equal, it has two Sides equal.

5. Two Triangles mutually Equilateral, are alſo Equiangular one to another.

6. If there be two Triangles, and in each one Angle and the two Sides including reſpectively Equal; or if one Side and the two Angles Adjacent be ſeverally Equal; then the two Triangles are equal; for if laid one upon another they will agree.

7. Two Sides of a Triangle are bigger than one; for the Arch of a great Circle is the ſhorteſt Diſtance between two Points on the Surface of a Sphere as a ſtreight Line is betwixt two Points in a Plane.

These ſeven Properties are common to plane Triangles and have a like Demonſtration.

8. All great Circles mutually cut each other into two equal Parts, for the common Section of their Planes is a Diameter of the Sphere, and conſequently the two Sections of their Peripheries are at a Semicircle Diſtance.

Hence it follows that every Side of a Spheric Triangle is leſs than a Semicircle. D B is leſs than the *Plate* IV. Semicircle D C.

Fig. III. 9. The oppoſite Angles at the Sections of two Circles are equal $\angle D = \angle C$, for the ſame Planes make both Angles.

10. In any Spheric Triangle if the Sum of the Legs of an Angle D B, B A be $\left.\begin{matrix}>\\=\\<\end{matrix}\right\}$ than a Semicircle D B C the intern Angle, at the Baſe D, is accordingly $\left.\begin{matrix}>\\=\\<\end{matrix}\right\}$ than the outward oppoſite Angle B A C, and conſequently the Sum of the two internal Angles at the Baſe D, D A B ſhall be $\left.\begin{matrix}>\\=\\<\end{matrix}\right\}$ than two $\lrcorner$.

DEMONSTRATION.

If $DB + BA$ be $\left.\begin{matrix}>\\=\\<\end{matrix}\right\}$ than D C, then B A is $\left.\begin{matrix}>\\=\\<\end{matrix}\right\}$ than B C; therefore, the Angle C, or which is equal to it D is $\left.\begin{matrix}>\\=\\<\end{matrix}\right\}$ than B A C. and the $\angle D + \angle DAB$ $\left.\begin{matrix}>\\=\\<\end{matrix}\right\}$ than $(\angle BAC + \angle DAB =)\ 2 \lrcorner$.

11. Coroll. In an Iſoſceles Triangle, if one of the equal Legs is $\left.\begin{matrix}>\\=\\<\end{matrix}\right\}$ than a Quadrant, the Angle at the Baſe is $\left.\begin{matrix}>\\=\\<\end{matrix}\right\}$ than $\lrcorner$

12. The Sum of the three Sides of a Triangle is leſs than a Circle for $BA < BC + AC$; therefore $DB + DA + BA < DBC + DAC$.

13. If from the point of an Angle as a Pole, you deſcribe a great Circle, or which is the ſame, if you deſcribe a Circle at the diſtance of 90 deg. from that Point, the Arc of this Circle intercepted between the Legs of the Angle, is the meaſure of the Angle.

14. The Poles of the ſides of any Triangle G H D, conſtitute another Triangle *n x m*, which we may call Supplemental to the Triangle G H D; For the Supplements of the $\left\{\begin{matrix}\text{Angles}\\ \text{Sides}\end{matrix}\right\}$ of the $\triangle$ *n x m* are equal to the $\left\{\begin{matrix}\text{Sides}\\ \text{Angles}\end{matrix}\right\}$ of the $\triangle$ G H D.

DEMONSTRATION.

From the Points G H D as Poles, deſcribe on the Globe 3 great Circles, x A *y*, R T *m n*, x B *n* Z, then *m* being the Pole of G H, *m y* is = Quadrant = A x, x or E being the Pole of G D, therefore adding *m* A on both ſides *m* x = A *y* = Supplement of C A, the meaſure of the $\angle$ H G D.

Z *n* = Quadrant, (*n* being the Pole of H D) = B x and adding B *n* on both ſides, *n* x = B Z = Supplement of B K the meaſure of the Angle H D G.

Plate IV. *Fig.* VII

n T = Quadrant = *m* R, and Subſtracting *m* T on both ſides *n m* = T R the meaſure of the Supplement of $\angle$ G H D. And here obſerve, that the Triangle *n* E *m* conſtituted between the 3 next Poles, hath its 3 $\left\{\begin{matrix}\text{Sides}\\ \text{Angles}\end{matrix}\right\}$ = $\left\{\begin{matrix}\text{Angles}\\ \text{Sides}\end{matrix}\right\}$ Of the Triangle G H D, ſave that the greateſt ſide *n m* is the Supplement of the Angle H, and the Angle E of the ſide G D.

15. Any Angle of a Triangle with the difference of the other two is $< 2\lrcorner$ for $xn < xm + mn$. i.e. $2\lrcorner - D < 2\lrcorner - G + 2\lrcorner - H$, and taking away $2\lrcorner$ on each ſide. $-D < 2\lrcorner - G - H$, and adding G and H on both ſides $G + H - D < 2\lrcorner$.

16. 2 Triangles A and B Mutually Equiangular, are alſo Mutually Equilateral, for becauſe they are Equiangular, their Supplimental Triangles α, β are Equilateral by the 14th, and therefore Equiangular by the 5th; and therefore the propoſed Triangles A and B whoſe ſides are the Supplements of thoſe Angles, are Equilateral by the 14th.

Plate IV.
Fig. IV. and VI.

17. Three Angles of every Triangle are $> 2\lrcorner$, and $< 6\lrcorner$ for $nx + xm + nm < 4\lrcorner$ (by the 12th) that is $2\lrcorner - D + 2\lrcorner - G + 2\lrcorner - H < 4\lrcorner$ that is, $6\lrcorner - D - G - H < 4\lrcorner$ and taking away $4\lrcorner$ on each ſide, $2\lrcorner - D - G - H < 0$ and adding D, G, H, on both ſides $2\lrcorner < D + G + H$.

2ly. The Sum of the Intern Angles is leſs than the Sum of the Intern and Extern, both which in all make but $6\lrcorner$.

Or thus, by the Figure to the 14th, the Supplement of nm is the meaſure of the Angle H; Em the meaſure of the Angle G, and En of D.

But the Supplement of nm added to nm makes but $2\lrcorner$ therefore the Supplement nm added to $Em + En$ is $> 2\lrcorner$, that is $G + D > 2\lrcorner$.

Or thus, by the 10th. the Angle B A C is $\left.\begin{matrix}>\\=\\<\end{matrix}\right\}$ than the Angle D. In this firſt caſe, make $FAC = D$ and produce A B to E.

Plate IV.
Fig. V.

Then $DF + AF = 2\lrcorner$, therefore $BF + AF < 2\lrcorner$, therefore $\angle FBE = DBA > FAB$, but $FAD + FDA = 2\lrcorner$, i. e. $FAB + BAD + BDA = 2\lrcorner$, therefore $DBA + BAD + BDA > 2\lrcorner$.

2. If $BAC = D$, then $BAD + BDA = 2\lrcorner$, therefore $BAD + BDA + ABD > 2\lrcorner$.

3. If $BAC < D$, then $BAD + BDA > 2\lrcorner$, therefore $BAD + BDA + ABD > 2\lrcorner$.

18. Of ſeveral Arcs of great Circles falling from the ſame point of the Spheres Surface on another Circle, the greateſt is that which paſſes thro' the Pole of the Circle and the next to this,

Plate IV.
Fig. VIII.

is greater than that which is farther off. For ſuppoſe P the Pole of the Circle, $C\omega D$ and ω the Pole of DPC; then is $AD(AP+PB) > AB > AE > AC$ and the Arc $B\omega C > BP > BD$.

19. A great Circle paſſing thro' the Poles of another great Circle cuts it at Right Angles; and on the contrary, if it cuts it at Right Angles it paſſes thro' its Poles. For the Angle of the Inclination of the two Planes is then right. $\angle PBD = \llcorner = PGD = PDB = \omega AC$.

20. In an Oblique Angled Triangle, if the Angles at the Baſe are like, that is, both Acute, or both Obtuſe, the Perpendicular let fall from the oppoſit Angle falls within the Triangle, and the Quadrantal Arc without: but if they be unlike, the Perpendicular falls without and the Quadrant within, for the Triangle EAF has $\angle\angle E, F$, Acute and the Perpendicular AC falls within, and the Quadrant $A\omega$ without, alſo the Triangle BAG has $\angle\angle B, G$, Obtuſe, and the Perpendicular AD within, and the Quadrant $A\omega$ without.

But the Triangle BAE has the $\angle\angle B, E$, of different kinds, and the Perpendicular AC without, and the Quadrant $A\omega$ within.

By the ſame Figure may the Ambiguities of Right Angled Triangles be Solved.

SOLUTIONS.

1. The Legs of the Right Angle are of the ſame kind with the oppoſite Angles, ſo in the Triangle BDA, becauſe $DA >$ Quadrant DP, the Angle $DBA > \llcorner DBP$, and in the Triangle BCA, becauſe $AC <$ Quadrant PC, $\angle CBA < \llcorner CBP$.

2. If the Legs (and conſequently the Angles) are of the ſame, or of different kind; the *Hypothenuſe* is accordingly $\lessgtr$ Quadrant. So in the Triangles EDA, ECA, the *Hypothenuſe* AE is $<$ Quadrant, but in the Triangle BDA, the *Hypothenuſe* AB is $>$ Quadrant BP.

3. *Vice Verſa*, if the *Hypothenuſe* < 90 deg. the Legs are Similar, and the 2. Oblique Angles are Similar; but if

the *Hypothenuſe* be $>$ 90 deg. the Legs are Diſſimilar, and the Oblique Angles Diſſimilar.

4. If the *Hypothenuſe* be $\lessgtr$ 90 deg. each Leg ſhall be $\left\{\begin{matrix}\text{Similar}\\ \text{Diſſimilar}\end{matrix}\right\}$ to its adjacent Angle, this follows from the 1ſt. and 2d. Sol.

5. And on the contrary if a Leg be $\left\{\begin{matrix}\text{Similar}\\ \text{Diſſimilar}\end{matrix}\right\}$ to its adjacent Angle, the *Hypothenuſe* will be $\lessgtr$ 90 deg.

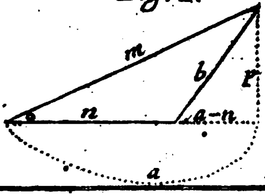
For Viewing the Sines, Co-ſines *and other Right-lines of Arcs which are not viſible in a common Sphere, 'tis convenient to uſe the Planes of the Arcs of three great Circles of Card Paſtbord, put together as in an* Armillar *Sphere.*

As ſuppoſe in the preceding Fig. 2 Arcs B P, B A, and that B P H the Plane of the greater Arc were Turn'd Round B H, till that a Right-line falling from P Perpendicular to the Plane B A H, may fall on ſome point of the Line C A, ſuppoſe on D; for in that Poſition P A B will be a Spheric Triangle, Right Angled at A, B P the *Hypothenuſe*, B A the Baſe, P A the Perpendicular Arc.

And.

Plate 4.

Fig. 1.



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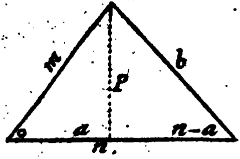

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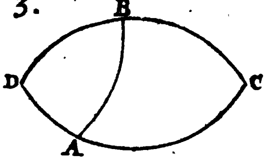

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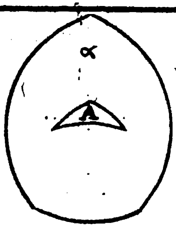

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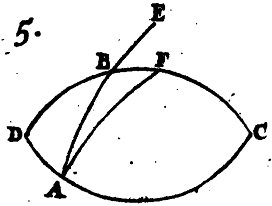

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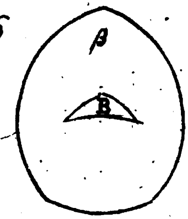

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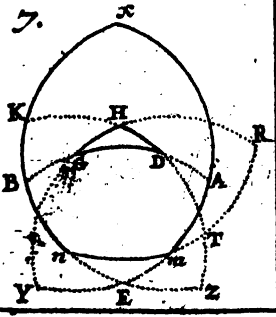

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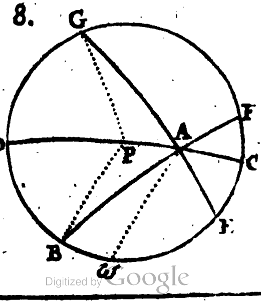

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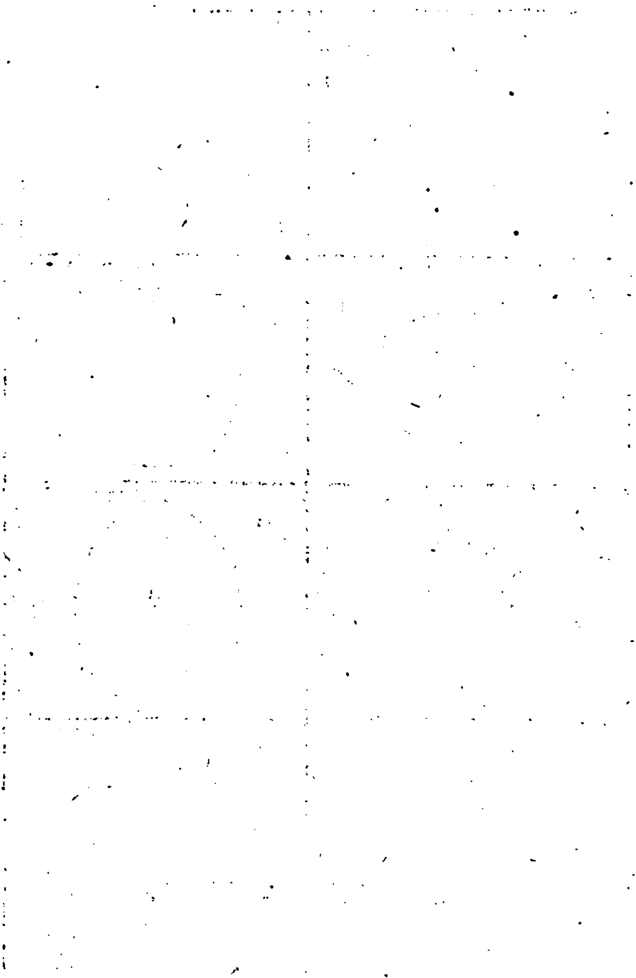

And ſuppoſe P A Num. 2. = P A of the Triangle, and fitted according to its Letters therein; and Draw A E, P F, Perpendicular to B C; ſo A E, P F, P D will be the ſines of the Arcs B A, B P, P A, and their Co-ſines will be E C, F C, D C; ~~theſe things~~ being done or conceived, rhe two firſt Axioms of *Spheric Trigonometry* will preſently appear, and conſequently the Demonſtration of the 16 Caſes of Right-angled Triangles: to which End let the Arc $\varpi\alpha$ Num. 3. be alſo fitted in the Solid according to its Letters: Then in the 2 Right-angled Spheric Triangles P B A, $\varpi B \alpha$ having the ſame Acute Angle B at the Baſe,

AXIOM. I.

The Sines of the *Hypothenuſes* are proportional to the Sines of the Perpendiculars.

PF. PD:: $\varpi C. \varpi\delta$.

AXIOM. II.

The Sines of the Baſes are proportional to the Tangents of the Perpendiculars.

AE: AG:: $\alpha C. \alpha\gamma$.

For the 2 Right Angle Triangles F P D, $c\varpi\delta$ are Simillar. Alſo, E A G, $C\alpha\gamma$ are Similar.

For the Solution of the following Caſes I ſuppoſe BPA a Right-angled Triangle, and its ſides produced to Quadrants, B N B M, A B; ſuppoſe alſo P E, P F, N G, and E G Quadrants.

Then is N E = B P, and the complement of B A = AM = $\angle$ A D M and F E = $\angle$ F P E = $\angle$ B P A, and G D = N M = $\angle$ B, and the Angles at A, M, N, E, F, right

Here follows the Table of the Proportions for the Solution of the 16 Caſes of Right-angled Spheric Triangles with the Solution of their Ambiguities.

Examples in Numbers.

CAse I. Given $BA = \overset{d}{30}.\overset{\prime}{00}$, $PA = 25.00$ } Reqd. BP.

Plate V.
Fig. I.

PROPORTION.

R. ⋝ BA : : ⋝ PA. ⋝ BP.

⋝ BA.	9.9375306
⋝ PA.	9.9572757
Sum.	19.8948063
Subst. R.	10.0000000
Rem.	9.8948063 the ⋝ of $\overset{d}{38}.\overset{\prime}{18}$ = BP

By the Gunter.

Extend your Compasses from the Radius in the line of Artificial Sines, to the Sine of 60 deg. (which is the complement of BA) the same Extent of the Compasses will reach from the Sine of 65 (which is the Complement of PA) to 51d 42′ the complement of 38 deg. 18 min. = BP.

Case 2d.

Numb.	1	2	3	4	5	6	7
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

d '

Caſe 2. Given AB = 30. 00 } Reqd. B. *Plate* V.
PA = 25. 00 } *Fig.* II.

PROPORTION.

S, BA. R :: T, PA. T. B

R. 10.0000000
T. PA. 9.6686725

Sum 19.6686725
Subſt. S, BA. 9.6989700

Rem. 9.9697025 T, B = 43 deg.
By the 1ſt. Sol

By the Gunter.

Extend your Compaſſes from the ſine of B A 30 deg. to the Radius, the ſine of 90 deg. the ſame Extent of the Compaſſes will reach on the Line of Artificial Tangents, from the Tangent of P A. 25 deg. to the Tangent of B. 42 deg.

Examples in Numbers.

CAſe I. Given $\left.\begin{array}{l} BA = \overset{d}{30}.\overset{\prime}{00} \\ PA = 25.00 \end{array}\right\}$ Reqd. BP.

Plate V.
Fig. I.

PROPORTION.

R. ≷ BA : : ≷ PA. ≷ BP.

≷ BA. 9.9375306
≷ PA. 9.9572757

Sum. 19.8948063
Subſt. R. 10.0000000

Rem. 9.8948063 the ≷ of $\overset{d}{38}.\overset{\prime}{18}$ = BP

By the Gunter.

Extend your Compaſſes from the Radius in the line of Artificial Sines, to the Sine of 60 deg. (which is the complement of BA) the ſame Extent of the Compaſſes will reach from the Sine of 65 (which is the Complement of PA) to 51d 42′ the complement of 38 deg. 18 min. = BP.

Caſe 2d.

Numb.	1	2	3	4	5	6	7
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

d '
Case 2. Given AB = 30. 00 } Reqd. B. *Plate* V.
PA = 25. 00 } *Fig.* II.

PROPORTION.

S, BA. R :: T, PA. T. B

R. 10.0000000
T. PA. 9.6686725

Sum 19.6686725
Subst. S, BA. 9.6989700

Rem. 9.9697025 T, B = 43 deg.
By the 1st. Sol

By the Gunter.

Extend your Compaſſes from the ſine of B A 30 deg. to the Radius, the ſine of 90 deg. the ſame Extent of the Compaſſes will reach on the Line of Artificial Tangents, from the Tangent of P A. 25 deg. to the Tangent of B. 42 deg.

Plate V.
Fig. III.

Caſe 3. Given $BP = 60^{d}.\ 00'$ }
$P = 50^{d}.\ 00'$ } Reqd B.

PROPORTION.

R. ≨ BP : : T, P, ∠ B.

≨ BP 9.6989700
T, P. 10.0761865

Sum 19.7751565
Subſt. R. 10........

Rem. 9.7751565 the ∠ B = $59^{d}.\ 13'$
Sol. the 2d.

By the Gunter.

Obſerve the Method in the former Caſes.

Caſe 4. Given $BP = 60^{d}.\ 00'$ }
$P = 50^{d}.\ 00'$ } Required P A.

Plate V.
Fig. IV.

PROPORTION.

R. ≨ P : : T, B P.

≨ P 9.8080675
T, B P 10.2385606

Sum 20.0466281
Sub. R. 10........

Rem. 10.0466281 T, P A = $48^{d}.\ 4'$.

Sol. the 4th.

Caſe 5. Given $\left.\begin{array}{l} BP = 60^{d}.\ 00' \\ P = 50.\ 00 \end{array}\right\}$ Reqd. B A.

Fig. V.
Plate V.

PROPORTION.

R. S, BP :: S, P. S, BA.

S, B P. 9.9375306
S, P 9.8842540

Sum. 19.8217846
Subt R. Remaind. 9.8217846 *S*, B A $= 41^{d}.\ 33'$
Sol. 1ſt.

Caſe 6. Given $\left.\begin{array}{l} PA = 36^{d}.\ 00' \\ P = 30.\ 00 \end{array}\right\}$ Reqd. B P.

Plate V.
Fig. VI

PROPORTION.

Σ P. R :: T, P A. T, B P.

R 10.0000000
T, P A 9.8612610

Sum 19.8612610
Subſt. Σ P. 9.9375306

Rem. 9.9237304 T, B P $= 39^{d}.\ 59'$
Sol. 5.

Plate V.
Fig. VII. Caſe 7, Given P A = 36. 00 (d ′), P = 30. 00 } Reqd. B

PROPORTION.

R. Σ P A : : S, P. Σ B.

Σ P A 9.9079576
S, P. 9.6989700

Sum 19.6069276
Subſt. R. Rem. 9.6069276 Σ B 66. 09 (d ′)

Sol. 1ſt.

Plate V.
Fig. VIII. Caſe 8, Given B A = 60. 00 (d ′), B = 37. 30 } Reqd. P A.

PROPORTION.

R, S, B A : : T, B. T, P A.

S, B A 9.9375306
T, B. 9.8849805

Sum 19.8225111
Subſt. R. Rem. 9.8225111 T, P A = 33. 36 (d ′)

Sol. 1ſt.

Caſe 9.

d ′
Caſe 9. Given PA = 16. 17 } Reqd. BA
B = 24. 40 }

Plate V.
Fig IX.

PROPORTION.

T, B. R : : T, PA. S, BA

R. 10.0000000
T, PA 9.4655386

Sum 19.4655386
Sub. T, B 9.6620434

d ′ d ′
Rem 9.8034952, S, BA = 39. 30, Or 140. 30

This Caſe is Ambiguous.

d ′
Caſe 10. Given PA = 16. 17 } Reqd. BP
B = 24. 40 }

Plate V,
Fig. X.

PROPORTION.

S, B. R : : S, PA. S, BP.

R. 10.0000000
S, PA. 9.4477586

Sum 19.4477586
Subſt. S, B. 9.6204884

d ′ d ′
Rem. 9,8272702, S, BP = 42. 12, or 137. 48
Ambiguous.

Caſe

Plate V. *Fig.* XI.

$$\text{Case 11. } \left.\begin{array}{r} PA = 16^{d}.\ 17' \\ B = 24.\ 40 \end{array}\right\} \text{Reqd. } P.$$

PROPORTION.

Σ PA. R :: Σ B. S, P.

R 10.0000000
Σ B. 9.9584450

Sum 19.9584450
Subst. Σ PA 9.9822201

Rem. 9.9762249 S, P = $71^{d}.\ 13'$ if PA falls between NM and B, if not 'tis 108. 47 *Ambiguous.*

Plate V. *Fig.* XII.

$$\text{Case 12. Given } \left.\begin{array}{r} PA = 37^{d}.\ 00' \\ PB = 46.\ 00 \end{array}\right\} \text{Reqd. } P$$

PROPORTION.

T, BP. R :: T, PA. Σ P.

R. 10.0000000
T, PA 9.8771144

Sum 19.8771144
Subst. T, B P 10.0151628

Rem. 9.8619516 Σ P = $43^{d}.\ 18'$

By the 3d. *Solution.*

Case

d '
Caſe 13. Given PA = 37. 00 } Reqd B. *Plate* V.
PB = 46. 00 } *Fig.* XIII.

PROPORTION.

S, BP. R :: S, PA. S, B.

R. 10.0000000
S, PA. 9.7794630

Sum 19.7794630
Subſt. S, BP 9.8579341

d '
Rem. 9.9215289 S, B. = 56. 35 *Sol.* 1.

d '
Caſe 14. Given PA = 37. 00 } Reqd. BA. *Plate* V.
PB = 46. 00 } *Fig.* XIV.

PROPORITION.

Σ PA. R :: Σ PB. Σ BA.

R. 10.0000000
Σ PB. 9.8417713

Sum 19.8417713
Subſt. Σ PA 9.9023486

d '
Rem. 9.9394227 Σ BA 4 = 29 34
By the 2d. *Solution.*

Caſe.

Plate V. *Fig.* XV.

Caſe 15 Given B = 46° 00′ } Reqd. BP
P = 59° 00′ }

PROPORTION.

T, P. R : : τB. Σ BP.

R. 10.0000000
τB. 9.9848372

Sum. 19.9848372
Subſt. T, P. 10.2212263

Rem. 9.7636109 Σ BP. = 54° 32′ *Sol.* 2.

Plate. V. *Fig.* XVI.

Caſe 16. Given B = 46° 00′ } Reqd. PA.
P = 59° 00′ }

PROPORTION.

S, P. R : : Σ B. Σ PA.

R. 10.0000000
Σ B. 9.8417713

Sum. 19.4817713
Subſt. S. P. 9.9330656

Rem. 9.9087057 Σ PA = 35° 52′

Plate V. *Fig.* XVII. Any Oblique Quadrantal Triangle, ZHP whoſe ſide HZ is a Quadrant, may be reduced to the Right-angled Triangle HNP by producing the other ſide ZP to N, ſo that ZN be a Quadrant; (or taking away a Quadrant if ZP had been bigger than a Quadrant) then in the Right-angled Triangle HNP, HN = ∠Z, and PN the Complement of ZP. and ∠PHN the Complement of ZHP.

The Lord *Neper* from a diligent Obſervation of the Proportions for ſolving the Caſes before mention'd; Found they might be ſolv'd by one General Propoſition.

For the Underſtanding of which, 'tis neceſſary to premiſe that he calls the 2 Legs (*viz.* the ſides including the Right Angle) together with the Complements of the other 3 Parts (*viz.* the *Hypothenuſe* and 2 Oblique Angles) *five Circular Parts*, taking no Notice of the Right Angle as being known; and if the 3 parts which enter the Queſtion, (of which 2 are given and 1 requir'd) have no interruption (a Right Angle coming between being accounted none) that part which is between the other two, is call'd the middle part, and the other two *Extremes Conjunct*; but if there be an interruption, that part which is ſeparated from the other two is call'd the *Middle part*, and the other two *Extremes Oppoſit or disjunct*.

For Inſtance in the Right-angled Triangle BPA.

		Extr. Conj.		Extr. Disj.
If BA	be mid. part then	Comp. B PA	and	Comp. P Comp. BP
PA		BA Comp. P		Comp. BP Comp. B
Com, P		Comp. BP PA		Comp. B BA.
Com. BC		Comp. B Comp. P		BA, PA.
Com. B		BA Comp. BP		Comp. P PA.

The Lord Neper'*s general Propoſition is thus*;

R × S, Middle part = ▭ Tang. of the Extreme Conjunct;

And R × S, Middle part = ▭ Coſines of the Extremes Disjunct.

That is, *The Radius multiplied by the Sine of the Middle part is equal to the Rectangle or Product of the Tangents of the Extremes Conjunct, and equal to the Rectangle or Product of the Co-ſines of the Extremes Disjunct.*

Hence, To find the Middle part, when the other two parts given are either { Extremes Conjunct,
Extremes Disjunct,

RULE I.

R. T, one Extreme :: T, other Extreme. S, Mid. part

R. Σ one Extreme :: Σ other Extr. S, Middle part.

Here you may obſerve, That when the Middle part is to be found, you muſt begin with the Radius; But when you are to find an Extreme either { Conjunct,
Disjunct,

RULE II.

T, one Extr. R :: S, Midd. part, T, other Extr.

Σ, one Extr. R :: S, Midd. part, Σ other Extr.

So that when one Extreme is to be found, the other Extreme muſt be the firſt Term.

Some few Examples to Exerciſe this Rule.

Caſe 1. $\left.\begin{array}{r} BA = 30\,d. \\ PA = 25 \end{array}\right\}$ Required B P.

Here the Complement of B P required is the middle part and the other two parts given are Extremes diſjunct; therefore by the 2d part of Rule 1ſt.

R. Σ one Extreme :: Σ other Extreme S mid. part
That is, R. Σ B A :: Σ P A. Σ B P.

the ſame Proportion as before, which being workt in Numbers already would be needleſs to repeat.

Caſe 2. where there are the ſame things given to find the Angle B.

Here B A is the middle part, and the Complement of B and P A are Extremes Conjunct.
Therefore, by the 1ſt part of the 2d Rule.

T, one Extream R. :: S, middle part, T, other Extreme
that is T, P A. R :: S, B A. τ B.

Caſe 3. given $\left.\begin{array}{r} BP = 60\,d. \\ P = 50 \end{array}\right\}$ Required B.

Here the Complement of B P is the middle part, and the Complements of B and P are Extremes conjunct.
Then by the 1ſt part of the 2d Rule.

T, one Extream R. S, middle part, T, other Extreme.
that is, τ P. R :: Σ B P. τ B.

Here though the 2 laſt Canons are not Exactly the ſame as thoſe produced in the former Solution of them, derived from the Production of the Sides of the Triangle,

gle, yet their coincedence with them will appear eaſily from the 3d Lemma.

I preſume 'twill be needleſs to give any farther inſtances of this General Rule of the Lord *Neper*.

Of the Solution of Oblique Spherical Triangles.

OBlique Spherical Triangles may be reduced to two Right-angled Spherical Triangles, by letting fall a Perpendicular, which Perpendicular either divides the Oblique propos'd into two Right, or makes two Right, by adding a Right-angle Triangle to it. *Plate* V. *Fig.* XIX. XVIII

In Oblique Triangles there are 12 Caſes, 10 of which may be ſolved (being thus prepar'd) by the 2 firſt Axioms, or by Rules deduced from them.

RULE I.

The Co-ſines of the Angles at the Baſe, are proportional to the Sines of the Angles at the Vertex.

Note, that B A, D A are the Baſes of the Right-angled Triangles B P A, D P A.
The Angles B, and D are the Angles at the Baſe; the Angles B P A, D P A are called Angles at the Vertex, B P and D P are called the Sides.

For by the 7th Caſe,

Plate VI. R. Σ P A : : S, B P A. Σ B.
Fig. I. R. Σ P A : : S, D P A. Σ D.

Therefore, Σ B. S, B P A : : Σ D. S, D P A.

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Fig: 1.

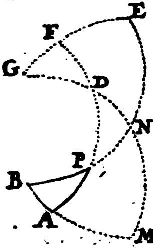
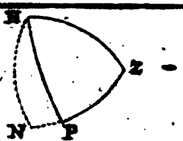


Plate 5.



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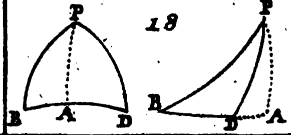

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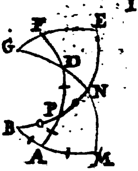

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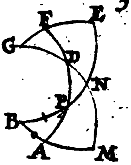

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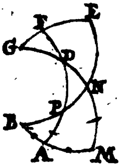

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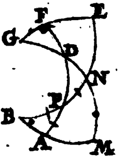

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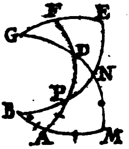

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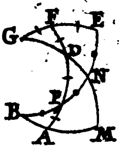

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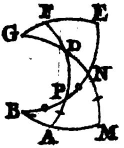

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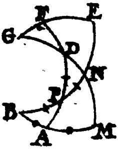

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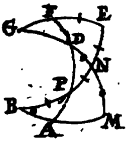

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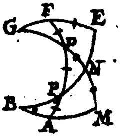

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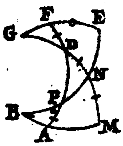

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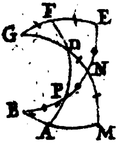

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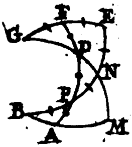

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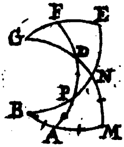

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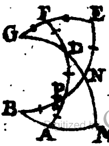

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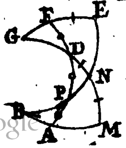

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For Proportions which are the ſame to one third, are the ſame one to another.

R U L E II.

The Co-ſines of the Sides are proportional to the Co-ſine of the Baſes.

For by the 1ſt Caſe,

R. ≲PA :: ≲BA. ≲BP.
R. ≲PA :: ≲DA. ≲DP.
Therefore, ≲BA. ≲BP :: ≲DA. ≲DP.

Plate VI.
Fig. II.

R U L E III.

The Sines of the Baſes are reciprocally proportional to the Tangents of the Angles at the Baſe.

For by the 2d Axiom,

S,BA. R :: T,PA. T,B
S,DA. R :: T,PA. T,D.

Therefore, S,BA × T,B = R × T,PA = S,DA × T,D.

Therefore, S,BA. S,DA :: T,D. T.B. for Equal Rectangles have their Sides reciprocally Proportional.

R U L E IV.

The Tangents of the Sides, are reciprocally Proportional to the Co-ſines of the Angles at the Vertex.

For by the 4th Caſe,

Plate VI.
Fig. III.

$$\text{T, BP. R :: T, PA.} \leqq \text{BPA.}$$
$$\text{T, DP. R :: T, PA.} \leqq \text{DPA.}$$

Therefore, $\text{T, BP} \times \leqq \text{BPA} = \text{R} \times \text{T, PA} = \text{T, DP} \times \leqq \text{DPA.}$

Therefore, $\text{T, BP. T, DP ::} \leqq \text{DPA.} \leqq \text{BPA.}$

AXIOM. III.

In any Triangle (whether Right-angled or Oblique) the Sines of the Sides are proportional to the Sines of the Oppoſite Angles.

For by the 1ſt Axiom,

$$\text{S, BP. R :: S, PA. S, B}$$
$$\text{S, DP. R :: S, PA. S, D.}$$

Therefore, $\text{S, BP} \times \text{S, B} = \text{R} \times \text{S, PA} = \text{S, DP} \times \text{S, D.}$

Therefore, $\text{S, BP. S, DP :: S, D. S, B.}$

Obſerve this Rule for the letting fall your Perpendicular.

Let it be let fall from the End of a given Side, and Oppoſite to a given Angle.

For by ſo doing you have enough given in one of the Right-angled Triangles to Determine any of its unknown parts.

The two firſt Caſes are ſolved each by one Operation by the 3d Axiom foregoing, the next eight Caſes are ſolved each by two Operations.

And that you may know what part of the Right-angled Triangle to find in your firſt Operation, *Obſerve to find ſuch a Part, which when found, the other part of the thing required (which is to be added to, or Subſtracted from the 1ſt Part found) may come under one of the four Rules mention'd.*

This will be eaſily underſtood from this General View of the Proportions for the Solution of the firſt 10 Caſes of Oblique Triangles, annexed.

Propor-

Proportions for the Solving the firſt 10 *Caſes of Oblique Triangles.*

Given.	Req.	Proportions.	Caſe.
B P. P D.	D	S, P D. S, B : : S, B P. S, D. *ambig.*	1
B P. B. D	P D	S, D. S, B P :: S, B. S, P D. *ambig.*	2
BP.PD.B	B D	Firſt, find B A. by the 4th Caſe, R. Σ B : : T, B P. T, B A. And then by the 2d Rule, Σ B P. Σ B A : : Σ D P. Σ D A. Then B A ± D A = B D, according as the Perpendicular falls within or without the Triangle, which is doubtful unleſs the kind of the Angle D were known.	3
BP.PD.B	P	Firſt, find B P A. by the 3d Caſe. Σ B P. R : : τ B. T, B P A. Then by the 4th Rule. T,DP. T,BP: : Σ BPA. Σ DPA. Then, B P A ± D P A = P,B D. and here the falling of P A within or without is doubtful, unleſs the kind of the Angle D be known.	4
B P. B. D	P	Firſt find B P A by the 3d Caſe Σ B P. R : : τ B. T, B P A. Then by the 1ſt Rule. Σ B. S, B P A : : Σ D. S, D P A. Then B P A ± D P A = B P D, that ⎰ B and D are alike is if ⎱ B and D are unlike.	5

Proportions for the Solving the firſt 10 *Caſes of Oblique Triangles.*

Given.	Req.	Proportions.	Caſe.
B P. B. D	B D	Firſt, find B A. by the 4th Caſe, ≨B. R :: τB P. τB A. then by the 3d Rule T, D. T, B :: S, B A. S, D A. then B A ∓ D A = B D if $\left\{\begin{matrix}\text{B and D}\\ \text{B and D}\end{matrix}\right\}$ are $\left\{\begin{matrix}\text{like}\\ \text{unlike.}\end{matrix}\right.$	6
P.P.B.P.	D	Firſt, find B P A. by the 3d Caſe, ≨B P. R :: τB. T, B P A. then by the 1ſt Rule S, B P A. S, D P A :: ≨B. ≨D. if B P A is greater than B P D & alſo B $\left\{\begin{matrix}\text{Acute}\\ \text{Obtuſe}\end{matrix}\right\}$ D is $\left\{\begin{matrix}\text{Obtuſe}\\ \text{Acute}\end{matrix}\right\}$ but if B P A is < B P D and B $\left\{\begin{matrix}\text{Acute}\\ \text{Obtuſe}\end{matrix}\right\}$ D is $\left\{\begin{matrix}\text{Acute}\\ \text{Obtuſe.}\end{matrix}\right.$	7
B. P, B P.	P D	Firſt, find B P A. by the 3d Caſe, ≨B P. R :: τB. T, B P A. then by the 4th Rule ≨D P A. ≨B P A :: T, B P. T, D P. if D P A is $\left\{\begin{matrix}\text{like}\\ \text{unlike}\end{matrix}\right\}$ B (or P A) D P is $\left\{\begin{matrix}\text{leſs}\\ \text{greater}\end{matrix}\right\}$ than Quadrant.	8

Proportions for the Solving the firſt 10 Caſes of Oblique Triangles.

Given.	Req.	Proportions.	Caſe.
BP.BD.B	D P	Firſt, find B A. by the 4th Caſe, Σ B. R : : ŧ B P. ŧ B A. Then by the 2d Rule Σ B A. Σ B P : : Σ D A. Σ D P. If D A is $\left\{\begin{matrix}\text{like}\\\text{unlike}\end{matrix}\right\}$ (P A) ∠ B then B D is $\left\{\begin{matrix}<\\>\end{matrix}\right\}$ Quadrant	9
BP.BD.B	D	Firſt, find B A. by the 4th Caſe, Σ B. R : : τ B P. τ B A. Then by the 3d Rule S, D A. S, B A : : T, B. T, D. if B A. is $\left\{\begin{matrix}<\\>\end{matrix}\right\}$ B D. then D is $\left\{\begin{matrix}\text{like}\\\text{unlike}\end{matrix}\right\}$ B.	10

The Actual Solution of the fore-mentioned Cases, in Numbers.

Case 1. Given B P = 34*d* 50′ } Reqd. D. *Plate* VI. *Fig.* IV.
D P = 25 30
B = 30 7

S, D P. S, B :: S, B P. S, D.

S, B. 9.7002802
S, B P. 9.7531280

Sum 19.4534082
Subst. S, D P. 9.6339844

Rem. 9.8194238 the Sine of D { 41*d* 17′ / 138 47 } if { Acute, / Obtuse.

Case 2. Given B P = 40*d* 00′ } Reqd. P D. *Plate* VI. *Fig.* V.
B = 80 00
D = 47 10

S, D. S, B P :: S, B. S, D P.

S, B P. 9.8080675
S, B. 9.9933515

Sum 19.8014190
Subst. S, D. 9.8653021

Rem. 9.9361169 the Sine of P D. = 59*d* 41′.

Plate VI.
Fig. VI.

Caſe 3. Given
$$\left.\begin{array}{rl} & \quad d \quad {}' \\ \text{B P} = & 39.\ 30 \\ \text{P D} = & 36.\ 20 \\ \text{B} = & 24.\ 00 \end{array}\right\}\text{Reqd. B}\hat{\text{P}}.$$

Firſt, R. Σ B :; T, B P. T, B A.

Σ B. 9.9607302
T, B P. 9.9161045

Sum 19.8768347
Subſt. R. 10.0000000

Rem. 9.8768347 the Tangent of B A. 36*d.* 59′

Then by the 2d. Rule,

Σ B P. Σ B A :: Σ D P. Σ D A.

Σ B A. 9.9024438
Σ D P. 9.9061107

Sum 19.8085545
Subſt. Σ B P 9.8874061

Rem. 9.9211484 the Σ D A = 33*d.* 30′

Then the $\left\{\begin{array}{l}\text{Sum}\\ \text{Diff.}\end{array}\right\}$ of $\left\{\begin{array}{ll}36d & 59'\\ 33 & 30\end{array}\right\} = \left\{\begin{array}{ll}70d & 29'\\ 3 & 29\end{array}\right\}$ = B D, according as the Perpendicular falls, within or without the Triangle.

Caſe 4. Given the ſame as before. Required P.

Firſt, Σ, BP, R :: τB. T, BPA.

R.	10.0000000
τB.	10.3514169
Sum.	20.3514169
Subſt. Σ PB.	9.8874061
Rem.	10.4640108 the Tan. of BPA. 71d. 03'

Then by the 4th Rule,

T, DP. T, BP :: Σ BPA. Σ DPA.

T, BP.	9.9161045
Σ, BPA.	9.5115397
Sum.	19.4276442
Subſt. T, DP.	9.8665644
Rem.	9.5610798 the Σ DPA. 68d. 40'

$$\text{Then the}\left\{\begin{array}{l}\text{Sum}\\ \text{Diff.}\end{array}\right\}\text{of}\left\{\begin{array}{ll}71^{d}.03' & \\ 68 & 40\end{array}\right\}=\left\{\begin{array}{ll}139^{d}. & 43'\\ 2 & 23\end{array}\right\}=\text{P.}$$

according as the Perpendicular falls $\left\{\begin{array}{l}\text{within}\\ \text{without}\end{array}\right\}$ the Triangle.

Caſe

Plate VI.
Fig. VII.

$$\text{Caſe 5. Given } \left.\begin{array}{l} BP = 60d.\ 10' \\ B = 40\ \ 00 \\ D = 50\ \ 00 \end{array}\right\} \text{Req. P.}$$

Firſt, Σ BP. R :: τ B. T, BPA.

R.	10.0000000
τ B.	10.0761865
Sum.	20.0761865
Subſt. Σ BP.	9.6967745
Rem.	10.3794120 the Tan. of BPA. 67d. 21′

Then by the Firſt Rule,

Σ B. S, BPA :: Σ D. S, DPA.

S, BPA.	9.9651426
Σ D.	9.8080675
Sum.	19.7732101
Subſt. Σ B.	9.8842540
Rem.	9.8889561 S, DPA = 50d. 45′

Then the Sum of $\left\{\begin{array}{l} 67.21 \\ 50.45 \end{array}\right\}$ *viz.* 118.06 = P. ſince the Angles B and D are of the ſame kind, but if they had been of different kinds, the Difference of theſe two Angles would have been equal to P.

Caſe 6. Given the ſame as before, Required B D.

Firſt, ≩ B. R :: τ B P. τ B A.

Plate VI.
Fig. VIII.

R.	10.0000000
τ B P.	9.7585170
Sum.	19.7585170
Subſt. ≩ B.	9.8842540
Rem.	9.8742630 the τ B A = 53 *d.* 11′

Then by the 3d Rule,

T, D. T, B :: S, B A. S, D A.

T, B.	9.9238135
S, B A.	9.9033923
Sum.	19.8272058
Subſt. T, D.	10.0761865
Rem.	9.7510193 S, D A. 34 *d.* 19′

Therefore the Sum of $\left\{\begin{array}{lll} BA & 53\,d. & 11' \\ DA & 34 & 19 \end{array}\right\}$ *viz.* 87 *d.* 30′ = B D ſince the Angles B and D are of the ſame kind, otherwiſe their diff. = B D.

Caſe

Plate VI. Caſe 7. Given BP = 60*d* 10′ \
Fig. IX. B = 40 10 } Req. D. \
P = 118 6

Firſt, Σ BP. R :: τ B. T, BPA.

R.	10.0000000
τ B.	10.0761865
Sum	20.0761865
Subſt. Σ BP.	9.6967745
Rem.	10.3794120 T, BPA = 67*d* 21′.

Then BPD — BPA = DPA = 50*d* 45′.

Then by the Firſt Rule,

S, BPA. S, DPA :: Σ B. Σ D.

S, DPA.	9.8889612
Σ B	9.8842540
Sum	19.7732152
Subſt. S, BPA.	9.9651426
Rem.	9.8080726 = Σ D = 50*d* 60′.

Plate VI. Caſe 8. Given the ſame. Required DP. \
Fig. X.

Firſt, Σ BP. R :: τ B. T, BPA.

Which will be found as before, 67*d* 21′, and conſequently DPA. 50*d* 45′.

Then by the 4th Rule,

≥ DPA. ≥ BPA :: T, BP. T, DP.

≥ BPA.	9.5855745
T BP.	10.2414830
Sum.	19.8270575
Subſt. ≥ DPA.	9.8012015

Rem. 10.0258560 T, DP. = 46d. 42′ and muſt be leſs than a Quadrant, becauſe DPA is of the ſame kind with B, that is of the ſame kind with PA, otherwiſe PD would have been more than a Quadrant by the 5th *Solution*.

Caſe 9 Given. BP = 60d. 10′ }
B = 40 00 } Reqd. PD. *Plate* VI. *Fig*. XI.
BD = 87 30 }

Firſt, ≥ B. R :: τ BP. τ BA.

Which will be found as in the 6th Caſe from the *Data* 53d. 11′; and Conſequently DA = 34d. 19′.

Then by the 2d Rule,

≥ BA. ≥ BP :: ≥ DA. ≥ DP.

≥ BP.	9.6967745
≥ DA.	9.9169455
Sum	19.6137200
Subſt. ≥ BA.	9.7776128

Rem. 9.8361072 ≥ DP = 46d. 43′

Becauſe DA is like B, or PA otherwiſe it would have been greater than a Quadrant.

Caſe

Caſe 10. Given as before, to find D.

Plate. VI. *Fig.* XII. 1. BA, as in the 9th and 6th Caſes, from the ſame *Data*, will be found 53*d.* 11′, and Conſequently DA = 34*d.* 19′.

Then by the 3d Rule.

S, DA. S, BA : : T, B. T, D.

S, BA.	9.9033923
T B.	9.9238135
Sum	19.8272058
Subſt. S, DA	9.7510991

Rem. 10.0761067. T, D. 50*d.* 00′ for here BA is < than BD and conſequently B and D are like.

LEMMA V.

The difference of the Verſed-ſines of two Arcs $\times \frac{1}{2}$ R, = S $\frac{1}{2}$ Sum of thoſe Arcs Multiplied by the Sine of the $\frac{1}{2}$ diff. of the Arcs.

Plate VI. *Fig.* XIII. Suppoſe the 2 Arcs AF, AE. the diff. of the Verſed-ſines, AG — AH = HG = FB the ſine of the $\frac{1}{2}$ Z of the Arcs is AD the Sine of the $\frac{1}{2}$ X of the Arcs in FO, now the Triangles ACD, EFB are Simillar, therefore AC, AD : : FE, FB or $\frac{1}{2}$ AC, AD : : $\frac{1}{2}$ FE (FO). FB, therf. $\frac{1}{2}$ AC × FB = FO × AD.

AXIOM.

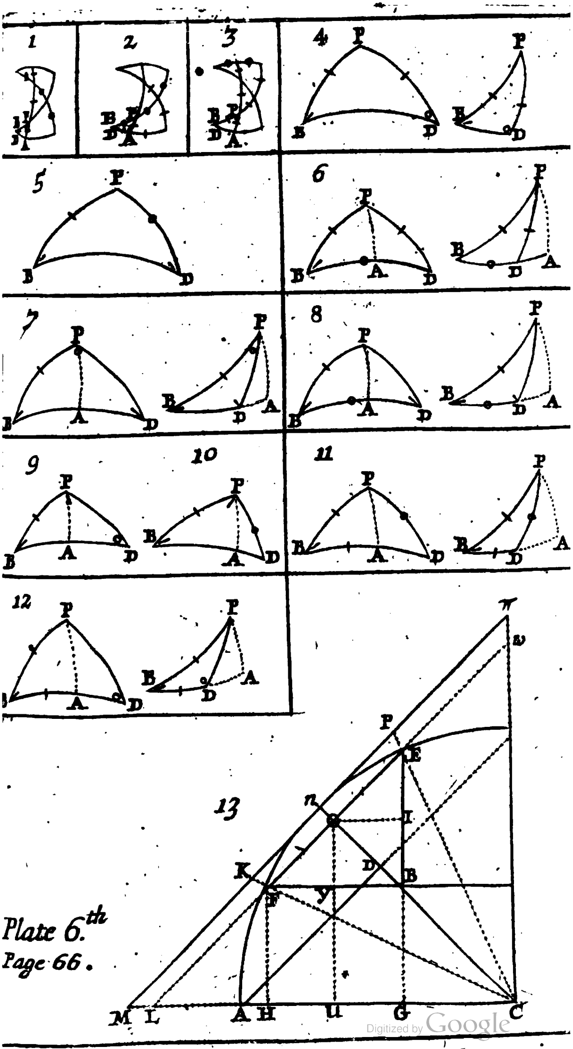


Plate 6.th
Page 66.

AXIOM. VI.

The Rectangle or Product of the ſines of the Legs, is to the Sqnare of the Radius, as the difference of the Verſed ſines of the Baſe, and of the difference of the Legs, is to the Verſed ſine of the Vertical Angle.

Suppoſe B the Angle Required, B A and B P (= B M) its Legs, and ſuppoſe P A the Baſe to be Oblique to the Plane B A, then will B P A be an Oblique Triangle.

Let fall Pβ Perpendicular to βm and my Perpendicular to Cα, and Pb Perpendicular to bA, and mL Perpendcular to C A, therefore βb is Perpendicular to C A, and bL = bA — L A = V Baſe — V diff. Legs.

Now A E, A C :: bL, βm }
And mF, αC :: βm, $y\alpha$ } and Multiplying the correſpondent terms of both Proportions.

A E x mF, A C x αC :: (bL x βm. βm x $y\alpha$) :: bL, $y\alpha$.

Now that A E, A C :: bL, βm will be evident from the Simillitute of the Triangles A E C, D L m, D $b\beta$.

there-

Therefore A E, A C : : (D L, D *m*) :: *b* L, *β m*, therf. A E, A C :: *b* L, *β m*, and that *m* F, *α* C : : *β m*, *y α*, will be evident from the conſtruction of the Figure, the 2 Right-angled Triangles P F *β*, *ϖ* C *y* are Semillar, and therefore,

P F, F *β* : : *ϖ* C, *c y*
i. e. m F, F *β* : : *α* C, *c y*
theref. *m* F, *m* F — F *β* :: *α* C, *α* C — *c y*
i. e. m F, *β m* : : *α* C, *y α*
and conſequently *m* F, *α* C : : *β m*, *y α*.

Caſe 11. The 3 ſides of any Spheric Triangle being given to find an Angle.

$S, m \times S, n, Rq :: \overline{S\frac{1}{2}B + \frac{1}{2}\text{diff.}}\ cr \times \overline{S, \frac{1}{2}\text{Baſe} - \frac{1}{2}\,\text{diff.}}\ cr.\ Sq\frac{1}{2}$ Angle, Dem. A E x *m* F, R *q* : : (by the 4th Axiom) *b* L, *y α* : : *b* L x ½ R, *y α* x ½ R (that is by *Lemma* 5th and 1ſt) $:: \overline{S\frac{1}{2}\text{Baſe} + \frac{1}{2}\text{diff.}}\ cr \times \overline{S\frac{1}{2}\ \text{Baſe} - \frac{1}{2}\,\text{diff.}}\ cr,\ Sq\frac{1}{2}$ Angle.

Inſtance in Numbers.

$$\text{Given,}\ \left.\begin{array}{lll} \text{B P.} & 60d & 10' \\ \text{D P.} & 46 & 42 \\ \text{B D.} & 87 & 30 \end{array}\right\}\text{Reqd. P.}$$

½ the Baſe is 43*d* 45′
½ the diff. of the Sides is 6 44
½ Baſe + ½ diff. *cr* is 50 29
½ Baſe — ½ diff. *cr* is 37 01.

$R\,q.$ 20.0000000
$S\,\overline{\tfrac{1}{2}\text{Baſe}+\tfrac{1}{2}\text{dif. }cr}\times S,\overline{\tfrac{1}{2}\text{Baſe}-\tfrac{1}{2}\text{dif. }cr}.$ 19.6669325

Sum 39.6669325
Subſt. $S,m\times S,n,$ 19.8002534

Rem. 19.8666791
$S\,q,\ \tfrac{1}{2}$ the Angle P, the $\tfrac{1}{2}$ of which 9.9333395 is the Sine of 59d 03′ $\tfrac{1}{2}$ the Angle required which being doubled is 118d 06′ = P.

COROLL. I.

Suppoſe $m,n,$ the Legs of the Angle required b the Baſe, $Z=m+n,\ X=m-n.\ z=\tfrac{1}{2}$ ſum of $m,\ n,\ b,$

Then, $S,m\times S,n,\ R\,q :: S,\overline{z-m}\times S,\overline{z-n}.\ S\,q\ \tfrac{1}{2}$ Angle.

Theref. $S\,q\,\tfrac{1}{2}\,\text{Angle}=\dfrac{R\,q\times S,\overline{z-m}\times S,\overline{z-n}.}{S\,m\times S\,n}$

Vlacq. preſcribes this following Rule, by two Proportions, which comes to the ſame;

$$S,m.\ S,\overline{z-m} :: S,\overline{z-n}.\ A.=\frac{S,\overline{z-m}\times S,\overline{z-n}}{S,m.}$$

$$\text{Then, } S\,n.\ R :: A.\left(\frac{S,\overline{z-m}\times S,\overline{z-n}}{S,m}\right).\ Q=\frac{R\times S,\overline{z-m}\times S,\overline{z-n}}{S,m\times S,n}$$

$$\text{Then } Q\times R=S\,q\,\tfrac{1}{2}\,\text{Angle}=\frac{R\,q\times S,\overline{z-m}\times S,\overline{z-n}.}{S,m\times S,n}$$

COR-

COROLL. II.

Putting $\mu =$ Compliment of m. *Gunter* reſolves the 11th Caſe by this ſingle Proportion.

$$S,m.\ \sigma n.\ ::\ \gtreqless B \backsim S,\overline{\mu+n}.\ V$$

For by the fourth Axiom,

$$S,m \times S,n.\ rr.\ ::\ VB \backsim V\,\overline{m-n}.\quad V.$$

And dividing the 1ſt and 2d Term by Sn,

$$\begin{aligned} S,m.\ \frac{rr}{Sn}\left(=\sigma n\right) &::\ VB \backsim V\,\overline{m-n}.\quad V. \\ &::\ \gtreqless B \backsim \gtreqless\,\overline{m-n}.\quad V. \\ &::\ \gtreqless B \backsim S,\overline{\mu+n}.\quad V. \\ \hline \text{Therf.}\quad S,m.\ \sigma n &::\ \gtreqless B \backsim S,\mu+n.\quad V. \end{aligned}$$

The three laſt third Terms being only different Deſignations of the ſame Quantity. For that $VB \backsim V\,\overline{m-n} = \gtreqless B \backsim \gtreqless,\overline{m-n}$, is evident on Inſpection of the Figure; and that $\gtreqless B \backsim \gtreqless,m-n = \gtreqless B \backsim S,\overline{\mu-n}$ will be evident, if we prove that $\gtreqless\,\overline{m-n} = S,\overline{\mu+n}$, which may be done thus;

Suppoſe $q =$ a Quadrant. Then the Complement of $m-n$ is $\overline{q-m+n}$, and in the room of μ, putting $q-m$, to which it is equal by *Hypotheſis*. $S,\mu+n = \overline{S,q-m+n}$, the Arcs be equal, the Sines are equal.

COROL.

COROLL. III.

$Sm \times S,n : Rq :: VZcr - V.$ Baſe. v of the Angle, being a Propoſition like the 4th Axiom.

For reſumeing the laſt Figure, reduce the plane B P to the ſame plane with B A, ſo that they may make one Circle and let fall $P\lambda$ perpendicular to A C. then $b\lambda = \lambda A - BA$ that is $V.Zcr - V.$ Baſe ; but

$$\left.\begin{array}{r} AE.\,AC :: b\lambda.\,\beta P \\ \text{and } mF.\,R. :: \beta P.\,v. \end{array}\right\}\text{and Multiplying the Correſpondent Terms}$$

we have $AE \times mF.\,Rq :: \beta P \times b\lambda.\,\beta P \times v.$ and dividing the 3d and 4th Term by $\beta P.$

we have $AE \times mF.\,Rq :: b\lambda.\,v.$ Angle required

or $Sm \times S,n.\,Rq :: b\lambda.\,v.$

Now that $AE.\,AC :: b\lambda.\,\beta P$ will be evident from the Similitude of the Triangles AEC, $Db\beta$, $DP\lambda$.

Therefore,

$$AE.\,AC :: Db.\,D\beta :: D\lambda.\,DP :: Db + D\lambda.\,D\beta + DP.\ i.e.\ b\lambda.\,DP.$$

Therefore $AE.\,AC :: b\lambda.\,DP.$

And that $mF.\,R :: \beta P.\,v.$ will be evident from the Similitude of the Right-angled Triangles βFP, $\gamma C\varpi$.

$$\text{For } FP.\,C\varpi :: F\beta.\,C\gamma :: FP + F\beta.\,C\varpi + C\gamma.\ i.e :: \beta P.\,\gamma\varpi.$$

and becauſe $FP = mF.$ and $C\varpi = R.$ and $\gamma\varpi = v.$

Therefore $mF.\,R :: \beta P.\,v.$ of the Angle.

This being prov'd, hence follows,

C O R-

COROLL. IV.

$S,m \times S n . R q :: S.\overline{\tfrac{1}{2} Z cr + \tfrac{1}{2} \text{Baſe}} \times S,\overline{\tfrac{1}{2} Z cr - \tfrac{1}{2} \text{Baſe}}$
$. \Sigma q \tfrac{1}{2}$ Angle.

For by the laſt Coroll. $S m \times S n . R :: b \lambda . v :: b \lambda \times \tfrac{1}{2} R . v \times \tfrac{1}{2} R$ (*i. e.* by Lem. 5th and 2d) $:: S \overline{\tfrac{1}{2} Z cr + \tfrac{1}{2} \text{Baſe}} \times S, \overline{\tfrac{1}{2} Z cr - \tfrac{1}{2} \text{Baſe}} . \Sigma q . \tfrac{1}{2}$ Angle. hence,

COROLL. V.

$S m \times S n . R q :: S . \text{ʒ} \times S . \overline{\text{ʒ} - B} . \Sigma q \tfrac{1}{2}$ Angle.

COROLL. VI.

$S, \text{ʒ} \times S, \overline{\text{ʒ} - B} . S, \overline{\text{ʒ} - m} \times S, \overline{\text{ʒ} - n} :: R q . T q \tfrac{1}{2}$ Angle.
For by the 5th and 1ſt Coroll.

$S, \text{ʒ} \times S, \overline{\text{ʒ} - B} . \Sigma q \tfrac{1}{2}$ Arch :: $(S m \times S n . R q) :: S, \overline{\text{ʒ} - m}$
$\times S, \overline{\text{ʒ} - n} . S q \tfrac{1}{2}$ Angle.

Therefore $S, \text{ʒ} \times \overline{\text{ʒ} - B} . S, \overline{\text{ʒ} - m} \times S, \overline{\text{ʒ} - n} ::$
$\Sigma q \tfrac{1}{2}$ Arch. $S q \tfrac{1}{2}$ Arch.

But becauſe $\Sigma . S :: R . T$.

Therefore,

9*d*. $S, \text{ʒ} \times S, \overline{\text{ʒ} - B} . S, \overline{\text{ʒ} - m} \times S, \overline{\text{ʒ} - n} :: R q . T q \tfrac{1}{2}$ Arch.

COROLL. VII.

$S, \overline{\text{ʒ} - m} \times S, \overline{\text{ʒ} - n} . S, \text{ʒ} \times S, \overline{\text{ʒ} - B} :: R q . \tau q \tfrac{1}{2}$ Angle.
This follows from the laſt, and becauſe $T, R :: R . \tau$.

COROLLARY VIII.

$VZ - VB . 2R :: VB - VX . VL$. Or,
$:: VZ - VB . v.L.$

Which is the Practice of *Foſter*, with his Line of Verſed Sines.

DEMONSTRATION.

By the *Fourth* Axiom.

$VB - VX . VL :: S,m \times S,n . Rq ::$ (*by Cor.* 3.) $VZ - VB . vL ::$ the Sum of the *firſt* and *fifth* Terms. Sum of the *ſecond* and *ſixth*. i. e. $:: VZ - VX . 2R.$

COROL. IX.

$$\frac{\Sigma Z \backsim \Sigma X}{2} . R :: \Sigma B \backsim \Sigma X . VL \text{ or}$$

$$\frac{\Sigma Z \backsim S.\overline{\mu + n}}{2} . R :: \Sigma B \backsim S,\overline{\mu + n} . V.L.$$

This follows from the *eighth Corollary*, and may be eaſily underſtood from what is ſaid in the Explication of the *ſecond Corollary*.

But here note, that if the Sum of m and n be $\left\{\begin{array}{l}\text{leſs}\\\text{greater}\end{array}\right\}$ than a Quadrant, the Σ of the Sum muſt be underſtood as $\left\{\begin{array}{l}\text{Affirmative}\\\text{Negative}\end{array}\right\}$ and added or ſubſtracted accordingly.

Caſe XII.

The three Angles being given; To find a Side.

The Angles adjacent to the Side required, call Legs, and the Angle oppoſite call the Baſe; then work as in the 11th Caſe.

For ſuch is the Operation in the Supplemental Triangle, whoſe Angles and Sides are equal to the Supplements of the Sides and Angles of the Triangle propoſed; and Arcs and their Supplements have the ſame Sines and Tangents.

Of the ſeveral Methods for the Solution of the 11th *Caſe, mentioned in the* 9 *Corollaries from the* 4th *Axiom; the* Reader *need only commit ſome one of them to Memory for his conſtant Uſe: Such as* Cor. I. *and* Cor. V. *The reſt being mentioned only that the* Reader *may know the Reaſon of the ſeveral Methods made uſe of by different Authors.*

So likewiſe the Lemma's *and Rules following are not to be thought of Abſolute Neceſſity, ſince the Solution of all the Caſes may be ſolved by what has been done before, they being (as before) inſerted to give the Reaſon of other Rules for the ſame Purpoſe; which a* Theoriſt *would not willingly be ignorant of.*

LEMMA VI.

The Sum of the Sines of two Arcs, is to the Difference of the Sines, as the Tangent of half the Sum of the Arcs is to the Tangent of half the Difference of them.

Z. Sines 2 Arcs. X. Sines : : T, $\frac{1}{2}$ Z Arcs. T, $\frac{1}{2}$ X Arcs.

Let the 2 Arcs be E A, F A (in the Fig. to *Lem.* V.) then 'twill be,

$$EG + FH.\ EG - FH :: \frac{EG + FH}{2}.\ \frac{EG - FH}{2}$$

i.e. *ou*. *oy* : : *o*L. *a*F : : *n*M. *n*K.

Theref. *ou*. *oy* : : *n*M. *n*K. q. e. d.

LEMMA VII.

Z, Co-ſines. X, Co-ſines : : τ $\frac{1}{2}$ Z Arcs. T, $\frac{1}{2}$ X Arcs.
If the Arcs are leſs than 90 Degrees. For in the forementioned Figure, the 2 Arcs being A E, A F. G C and C H are their Co-ſines; it will be

$$CH + CG.\ CH - CG :: \frac{CH + CG}{2}.\ \frac{CH - CG}{2}.$$

i.e. *cu*. *u*H : : *a* O. *o*F : : π N. NK.

Therf. *cu*. *u*H : : π N. N K.

But if the Arcs are bigger than 90 Degrees,

Z, Coſines, X, Coſines : : T, $\frac{1}{2}$ Z Arcs. τ $\frac{1}{2}$ X Arcs.

The Tangents of 2 Arcs being reciprocally proportional to their Co-tangents, by the *third Lemma*.

LEMMA VIII.

Z, Tangents. X, Tangents :: S, Z Arcs. S. X Arcs.

Let the Arcs be N A. N E.

P*m*. K*m* :: E L. F L :: E G. F H.

Theref. P*m*. K*m* :: E G. F H. Q.E.D.

LEMMA IX.

$$S, \text{Arc} = \frac{S, \frac{1}{2}\,\text{Arc} \times \Sigma\, \frac{1}{2}\,\text{Arc.}}{\frac{1}{2}\,R}$$

For in *Fig.* 10. A E. F *n* :: B *n*. $\frac{1}{2}$ FB = $\frac{1}{2}$ R. the Triangles A E B, F *n* B. are Similar.

Theref. $$AE = \frac{Bn + Fn}{\frac{1}{2}\,FB} = \frac{S, \frac{1}{2}\,\text{Arc} \times \Sigma\, \frac{1}{2}\,\text{Arc.}}{\frac{1}{2}\,R}$$

LEMMA X.

The Sines of two Arcs A, E, are proportional to the Rectangles under the Sines and Co-sines of their $\frac{1}{2}$ Arcs.

S, A. S, E :: (by the *ninth Lemma*) $\frac{S, \frac{1}{2} A \times \Sigma\, \frac{1}{2} A.}{\frac{1}{2} R.}$

$\frac{S, \frac{1}{2} E \times \Sigma\, \frac{1}{2} E}{\frac{1}{2} R}$ :: S, $\frac{1}{2}$ A $\times$ Σ $\frac{1}{2}$ A. S, $\frac{1}{2}$ E $\times$ Σ $\frac{1}{2}$ E.

LEM-

LEMMA XI.

The Tangents of two Arcs A, E, are proportional to the Rectangles under the Sines and Secants of thoſe Arcs.

i.e. T, A. T, E :: S, A × ſ, A. S, E × ſ, E.

For T, A. T, E :: $\frac{\text{S, A} \times \text{R}}{\Sigma \text{A}}$. $\frac{\text{S, E} \times \text{R}}{\Sigma \text{E}}$ :: S, A, × Σ E × R. S, E × Σ A × R :: S, A × Σ E. S, E × Σ A :: S, A × ſ, A. S, E × ſ, E.

For by the *fourth Lemma*, the Co-ſines of two Arcs are reciprocally proportional to their Secants.

RULE V.

The Tangents of the *Baſes* are proportional to the Tangents of the Angle at the Vertex. *Plate* V.

For, by the *ſecond* Axiom, *Fig.* xviii.

T, *L* BPA. T, BA (:: R. S, PA) :: T, DPA. T, DA.

Theref. T, BPA. T, BA :: T, DPA. T, DA.

RULE VI.

S, Z, *Cr.* S, X, *Cr* :: T $\frac{1}{2}$ Z, *LL* at the Vertex. T, $\frac{1}{2}$ X *LL*, at the Vertex :: T $\frac{1}{2}$ X *LL*, at the Vertex. T, $\frac{1}{2}$ Z *LL*, at the Vertex.

DEMONSTRATION.

For, by the *fourth* Rule,

T, BP. T, DP :: Σ, DPA. Σ, BPA.

Therefore,

T,BP + T,DP. T,BP — T,DP :: ≷D + PA≷BPA. ≷DPA — ≷BPA.

That is, by *Lemma* VIII. and VII.

As S,Z *Cr*. S,X *Cr* :: τ ½ Z *LL*, at the Vertex. T, ½ X *LL*, at the Vertex.

RULE VII.

T, ½ Z *cr*. T, ½ X *cr* :: T, ½ Z *LL*, at Baſe. T, ½ X *LL*, at Baſe.

Therefore,

τ ½ Z *cr*. τ ½ X *cr* :: T, ½ X *LL*, at Baſe. T, ½ Z *LL*, at Baſe.

DEMONSTRATION.

For, by the *third* Axiom,

S, BP. S, DP :: S,D. S, B.

Therefore,

S, BP + S, DP. S,BP — S,DP :: S, D + S, B. S, D — S, B.

Therefore, by the *ſixth* Lemma,

$$T,\frac{BP+DP.}{2}\ T,\frac{BP\backsim DP}{2} :: T,\frac{D+B.}{2}\ T,\frac{D\backsim B.}{2}$$

RULE VIII.

τ ½ Z *LL*, Vertex. T, ½ Z *LL*, Baſe :: T, ½ X *LL*, Baſe. T, ½ X *LL*, Vertex.

For, by the *firſt* Rule,

S, BPA. S, DPA :: ≷ B. ≷ D.

Therefore,

$$S,BPA + DPA.\ S,BPA - S,DPA :: \Sigma B + \Sigma D.\ \Sigma B - \Sigma D.$$

Therefore, by *Lemm.* VI, VII.

$$T,\frac{BPA + DPA.}{2}\ T,\frac{BPA \backsim DPA}{2} :: \frac{\tau, B + D.}{2}\ T,\frac{B \backsim D.}{}$$

$$\text{Theref.}\ T,\frac{B \backsim D.}{2}\ T,\frac{BPA \backsim DPA}{2} :: \left(\tau\frac{B + D.}{2}\ T,\frac{BPA + DPA}{2}\right) :: \tau\frac{BPA + DPA.}{2}\ T,\frac{B + D.}{2}$$

PROBLEM I.

In any Spheric Triangle BPD. *Given the Angle* P, *and the Sides* BP, DP. *To find the two Angles at the Baſe.*

$S, \frac{1}{2} Z\,\mathit{cr}.\ S, \frac{1}{2} X\,\mathit{cr} :: \tau \frac{1}{2} P.\ T, \frac{1}{2} X\,\mathit{LL}$, Baſe,
And $\Sigma \frac{1}{2} Z\,\mathit{cr}.\ \Sigma \frac{1}{2} X\,\mathit{cr} :: \tau \frac{1}{2} P.\ T, \frac{1}{2} Z\,\mathit{LL}$, Baſe.

DEMONSTRATION I.

Rule 6. $S, Z\,\mathit{cr}.\ S, X\,\mathit{cr} :: \tau \frac{1}{2} P.\ T \frac{1}{2} X\,\mathit{LL}$, Vertex,
Rule 7. $T, \frac{1}{2} Z\,\mathit{cr}.\ T, \frac{1}{2} X\,\mathit{cr} :: T \frac{1}{2} Z\,\mathit{LL}$, Baſe,
$T \frac{1}{2} X\,\mathit{LL}$, Baſe,
Rule 8. $T, \frac{1}{2} Z\,\mathit{LL}$, Baſe, $T \frac{1}{2} X\,\mathit{LL}$, Vertex $:: \tau \frac{1}{2} P$
$T \frac{1}{2} Z\,\mathit{LL}$, Baſe.

Therefore, Multiplying the Homologous Terms into each other, and Dividing the 1ſt and 3d Products; as likewiſe the 2d and 4th by what is an equal Component in each; and we have,

$$S,Z\,cr. \times T\tfrac{1}{2}Z\,cr.\ S,X\,cr \times T\tfrac{1}{2}X\,cr :: \tau q\tfrac{1}{2}P.\ Tq\tfrac{1}{2}X\,LL, \text{ Baſe.}$$

Therefore (by LEMMA I.)

$$Sq\tfrac{1}{2}Z\,cr.\ Sq\tfrac{1}{2}X\,cr :: \tau q\tfrac{1}{2}P.\ Tq\tfrac{1}{2}X\,LL, \text{ Baſe.}$$

And therefore the Roots of theſe Quantities are Proportional.

$$S,\tfrac{1}{2}Z\,cr.\ S\tfrac{1}{2}X\,cr :: \tau\tfrac{1}{2}P.\ T\tfrac{1}{2}X\,LL, \text{ Baſe,} \quad \text{Q. E. D.}$$

DEMONSTRATION II.

By Rule 6. $S,Z\,cr.\ S,X\,cr :: \tau\tfrac{1}{2}P.\ T\tfrac{1}{2}X\,LL,$ Vertex.

Rule 7. $\tau\tfrac{1}{2}Z\,cr.\ \tau\tfrac{1}{2}X\,cr :: T\tfrac{1}{2}X\,LL,$ Baſe, $T,\tfrac{1}{2}Z\,LL,$ Baſe.

Rule 8. $T\tfrac{1}{2}X\,LL,$ Baſe, $T\tfrac{1}{2}X\,LL,$ Vertex $:: \tau\tfrac{1}{2}P.\ T\tfrac{1}{2}Z\,LL,$ Baſe.

Therefore, Multiplying the Homologous Terms into each other, and Dividing the 1ſt and 3d Products; as likewiſe the 2d and 4th by what is an equal Component in each, We have,

$$S,Z\,cr. \times \tau\tfrac{1}{2}Z\,cr.\ S,X\,cr \times \tau\tfrac{1}{2}X\,cr :: \tau q\tfrac{1}{2}P.\ Tq\tfrac{1}{2}Z\,LL, \text{ Baſe.}$$

Therefore (by LEMMA II.)

$$\Sigma q\tfrac{1}{2}Z\,cr.\ \Sigma q\tfrac{1}{2}X\,cr :: \tau q\tfrac{1}{2}P.\ Tq\tfrac{1}{2}Z\,LL, \text{ Baſe.}$$

Therefore,

$$\Sigma\tfrac{1}{2}Z\,cr.\ \Sigma\tfrac{1}{2}X\,cr :: \tau\tfrac{1}{2}P.\ T\tfrac{1}{2}Z\,LL, \text{ Baſe.} \quad \text{Q. E. D.}$$

This Demonſtration ſuppoſeth $P = Z\,LL$, at Vertex. that is, that the Perpendicular falls within the Triangle; but the ſame Proportions will ariſe, if it falls without.

PROBLEM II.

In any Spheric Triangle let there be given two Angles, with the interjacent Baſe (or ſide included between thoſe Angles;) To find the other two Sides, and the remaining Angle.

S, ½ Z *LL*. S, ½ X *LL* :: T ½ Baſe. T, ½ X *cr*.

Σ, ½ Z *LL*. Σ ½ X *LL* :: T ½ Baſe. T, ½ Z *cr*.

The Demonſtration may be perform'd by the ſame *Lemma's* and *Rules* that the preceding was; but will be needleſs, if you change the laſt Triangle into its Supplemental.

RULE IX.

In any Sphæric Triangle having let fall a Perpendicular Arc from the Vertex to the Baſe, it will be

T ½ Z Segm. of the Baſe. T ½ Z *cr* :: T ½ X *cr*. T ½ X Segm. of the Baſe.

~~For, by the *ſecond* Rule~~,

Σ B P. Σ D P :: Σ B A. Σ D A.

Therefore,

Σ BP + Σ DP. Σ B P ∽ Σ DP :: Σ BA + Σ DA . Σ BA ∽ Σ DA.

Therefore, by *Lemma* VII.

τ ½ Z *cr*. T ½ X *cr* :: τ ½ Z Segm. T ½ X Segm.

Therefore,

T ½ X *cr*. T ½ X Segm. (:: τ ½ Z *cr*. τ ½ Z Segm.) :: T ½ Z Segm. T ½ Z *cr*.

M PROB

PROBLEM.

Suppoſe there are given the three Sides of a Sparical Triangle, To find an Angle. Having imagin'd a Perpendicular let fall, to make two Right-angled Triangles.

$$T\,\tfrac{1}{2}\,\text{Baſe}.\ T\,\tfrac{1}{2}\,Z\,cr :: T\,\tfrac{1}{2}\,X\,cr.\ T, F.$$

Then $F \underset{\backsim}{+} \tfrac{1}{2}$ Baſe $\equiv \left\{\begin{matrix}\text{greater}\\ \text{leſſer}\end{matrix}\right\}$ Segment, and if $F \begin{matrix}>\\ <\end{matrix} \tfrac{1}{2}$ Baſe, the Perpendicular falls $\left\{\begin{matrix}\text{without}\\ \text{within}\end{matrix}\right\}$ the Triangle.

$$\text{Then, } R.\ \tau BP :: T, BA.\ \Sigma B.$$
$$R.\ \tau DP :: T, DA.\ \Sigma D.$$

FINIS.

OF
Stereographic Projection
OF THE
SPHERE.

Stereographick Projection is a Branch of *Perſpective*, which teacheth us how to draw the Appearances of the Circles of the Globe, upon a Plane paſſing thro' the Centre thereof; ſuppoſing the Eye in Surface of the Globe in the Pole of the Circle on which the Projection is to be made. And here the firſt thing that ought to be done, is to prove that the Repreſentation of all Circles deſcribed upon the Surface of the Globe (whether greater or leſſer) ſhall be Circles upon the Plane of the Projection. In order to which I premiſe this

LEMMA.

Plate VII. *Fig.* I.

If a Scalene Cone, A B C, whoſe Baſe is a Circle, be cut by a Plane paſſing thro' the Vertex A, and Center of the Circle of the Baſe; making the Triangle A B C, (the Plane of which Triangle being Perpendicular to the Plane of the Baſe of the Cone.) I ſay, That if this Cone be ſuppoſed to be cut by two other Planes (perpendicular to the Plane of the Triangle) the one Parallel to the Baſe as F G, the other E D, ſo as to make the Triangle A E D, ſimilar to the Triangle A C B. the Curvities F H G, E H D, ſhall be Circles, as is proved by *Apollonius*, *Mygdorgius*, and other Writers of *Conics*.

PROP. I.

If from the Eye at A, plac'd in the Globes Superficies, there be infinite Right Lines imagin'd to be produced to the Periphery of any Circle (ſmall or great) B C, deſcribed on it, thereby making a Conic Superficies. I ſay, the common Interſection of the Surface of this Cone, with the Plane of the Circle E G (in whoſe Pole the Eye is placed) or any other Plane D C, parallel to it, ſhall be a *Circle*.

Plate VII. *Fig*.II,III.

DEMONSTRATION.

The Triangle A B C, is the Section of the Cone thro' its Vertex and Centre of the Baſe. Now if we prove that the Triangles A B C, and A C β, are ſimilar, the Propoſition will be manifeſt.

Now the Arc D A = C A. therefore the Angle A B C = A C β, by the 20th of the *third* of *Euclid*; and the Angle A, common to both Triangles, therefore the Triangles A B C, and A C β, are ſimilar; And therefore by the *Lemma*, the common Sections, C β, and *c b*, which is parallel to it, ſhall be Circles.

COROL. I.

From hence 'tis evident, that if the Circle to be projected, be parallel to the Plane on which the Projection is drawn, its Repreſentation will be a *Circle*; for the Cone is cut by a Plane parallel to its Baſe.

II. If it be any way Oblique to the Plane of the Projection, its Repreſentation will be a Circle, ſince the One will be cut according to the Lemma.

III. But if the Eye be in the Plane of any Circle, its Repreſentation will be a right Line, the Lines drawn from the Eye to the Periphery being in the ſame Plane, and the common Section of two Planes is a right Line.

IV. The Line *b c* is the projected Diameter of the Circle B C. the Line E G in which is the projected Diameter, I call with Mr. *Oughtred* the *Line of Meaſures.*

P R O P. II.

If a great Circle be to be projected upon the Plane of another great Circle, the Center of the projected Circle ſhall lie in the *Line of Meaſures*, diſtant from the Center of the Primitive Circle (or Circle on which the Projection is drawn) by the Tangent of the Elevation of the ſaid Circle above the Plane of the Projection.

Plate VII. *Fig.* IV.

DEMONSTRATION.

Suppoſe the Eye at A, projecting the great Circle B C, upon the Plane of the Circle E G; the Point B, appears in the Line of Meaſures at *b*. ſo that F *b* is the Tangent of ½ the Angle H F B, the Diſtance of the Point B, from the Vertex, by the 20th of the *third* of *Euclid*, and C, the other Extremity of the Diameter of the Circle B C, appears in the Line of Meaſures at *c*, ſo that the Diſtance F *c*, is the Tangent of ½ the Angle H F C, the Diſtance of the Point C from the Vertex, the Line *b c* being biſſected in *i*, *i* is the Center.

Now the right angled Triangle *b* A *c*, is divided by the Perpendicular A F, into two right angled Triangles

b A F,

b A F, A *c* F, Similar to each other by the 8th of the 6th Book of *Euclid*.

Therefore the ∠ *b* A F $= \frac{1}{2}$ B F H $=$ A *c* F $= \frac{1}{2}$ A *i* B. Therefore the Angle B F H $=$ A *i* B and conſequently their Complements are equal *viz*. B F E $=$ F A *i*. Therefore F *i*, the Diſtance of the Center of the projected Circle from the Center of the Primitive Circle is equal to the Tangent of the Arch E B, the Elevation of the Circle to be projected to the *Radius* AB of the Primitive Circle, *q. e. d.*

Mr. *Oughtred* determining only *b* the Appearance of the Extremity of the Diameter above the Plane of the Projection, gives this Rule for deſcribing the Circle.

From H the Pole of the Line of Meaſures make H *m* $=$ B E $=$ *m n*, and draw the Lines A *m*, A *n*, *p* ſhall be the projected Pole of B C and *i* its Center. The *Radius* being *i b* $=$ *i* A. which he proves thus, the Angle *i b* A $=$ *i* A *b*

Becauſe the Angle $i \overset{bA}{=} b$ B F $+$ B F *b* that is F A *b* $+$ F A *i*, for the Arc H *n* $=$ 2 B E by Conſtruction. Hence F *i*, is evidently the Tangent of BE. and A I, its Secant $=$ *b i*.

COROL. [illegible]

Hence the Secant of the Circles Elevation ſet off in the Line of Meaſures from *b*, the projected Extremity of the Diameter above the Plane of the Projection will give *i* its Center, as well as the Tangent of that Elevation from the Center.

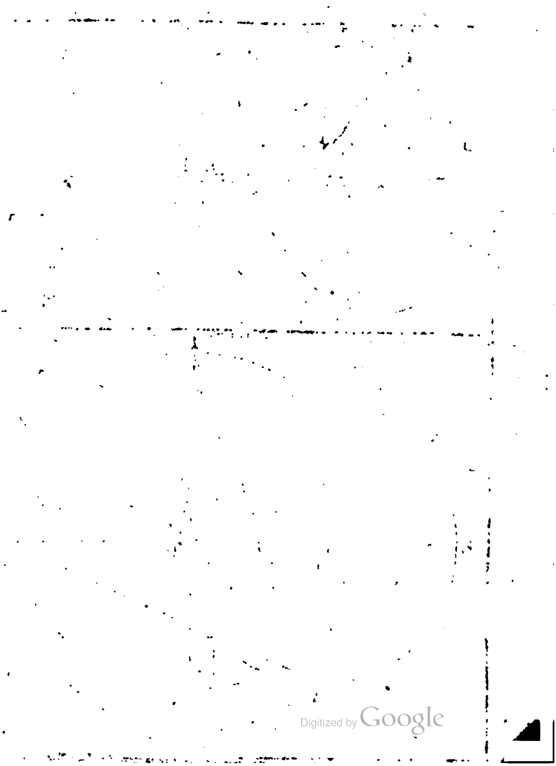


Plate 7.

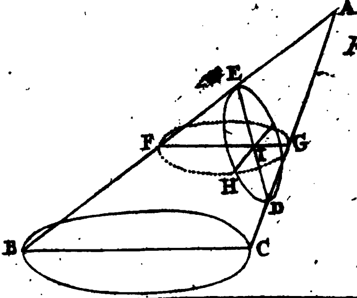
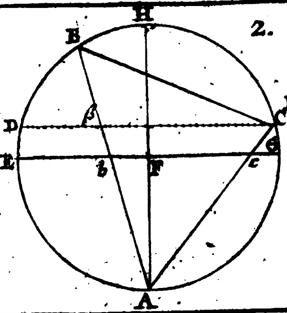
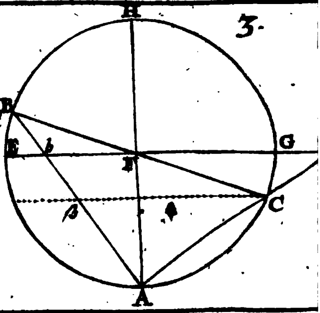


Fig. 1.



2.



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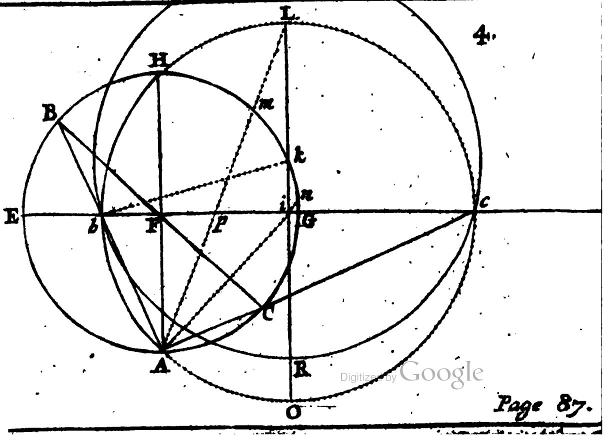


4.

PROP. III.

If a leſſer Circle whoſe Poles lie in the Plane of the Projection were to be projected; The Center of its Repreſentation on the Plane ſhall be in the Line of Meaſures diſtant from the Center of the Primitive Circle by the Secant of that leſſer Circles diſtance from its Pole, and its Semidiameter ſhall be equal to the Tangent of that Diſtance.

Plate VIII. *Fig.* I.

DEMONSTRATION.

Suppoſe the leſſer Circle paſſing through the Points B, C, equally diſtant from the Pole G, were to be projected, upon the Plane E G, to the Eye at A. Draw the Lines A B, A C, interſecting the Line of Meaſures in *b* and *c*, the Repreſentation of the two Extremities of the Diameter, biſſect the Line *b c* in *i*, then is *i* the Center, upon the Point *i* with the Diſtance *i b*, deſcribe the Circle *i b* B *b* K *c*, draw the Lines H B *c*, F B, and *i* B.

The two Triangles A H B, and C H F, having the Angle at H Common, and the Angles at B and F right, are Similar.

Therefore $\angle$ H A B $=$ $\angle$ H *c* F

but $\angle$ H A B $= \frac{1}{2}$ H F B

and $\angle$ H *c* F $= \frac{1}{2}$ *b i* B.

Therefore $\angle$ H F B $=$ $\angle$ *b i* B. Therefore the Triangle F B *i* is right angled at B. and conſequently B *i* is the Tangent of the Arc, B G the Diſtance of the leſſer Circle from its Pole, and F *i* its Secant. Q. E. D.

Q

Mr. *Ougbtred*, only makes uſe of *b* the Repreſentation of B, and then directs to draw the Radius F B, and B *i* Perpendicular to it, touching the Circle B G. proves *i* to be the Center, the Radius being *i b* = *i* B, thus

the *L i b* B = *L i* B *b*

For the *L b* = F B *b* + B F *b* that is = *b* B *c* + C B *i* = *b* B *i*.

PROP. IV.

If two Circles C B F, and A B I, interſect each other, the Angle F B I, found by them at their Interſection, ſhall be equal to the Angle C B A, made by the Radii C B, A B, drawn to the Point of their Interſection B.

DEMONSTRATION.

Plate VIII. *Fig.* II.

To the Point of Interſection B, draw the Line D B a Tangent to the Circle C B F, and E B a Tangent to the Circle A B I. Now becauſe the infinitely ſmall Portions of the Circles C B F, and A B I do coincide with the Tangents D B, and B E, and conſequently have the ſame Direction, therefore the Curve lined Angle F B I = to the right lined Angle formed by the Tangents D B E. Now the Angle C B D = ⊥ = A B E, and taking away E B C which is common to both, there will remain C B A = D B E *ie* = F B I. *q. e. d.*

PROP. V.

In *Stereographic Projection* the Angles made by the Circles on the Surface of the Sphere are equal to the Angles made by their Repreſentatives on the Plane of the Projection.

DEMON-

DEMONSTRATION.

Suppoſe the Eye at A, projecting the Angle R B S; upon the Plane E F; Let B D, be a Tangent to the Circle BS and B C, to the Circle B R, to the common Point B: The Plane E F, and likewiſe the plane made by the Tangents B D, and B C, are both perpendicular to the Plane of the Circle B Q A, and their common Section D C, will therefore be perpendicular to the Line E F, produced.

Plate VIII. *Fig.* III.

The Eye at A, projects the Tangent B D in F D, and the Tangent B C in F C.

I am now to prove that the Angle C B D, made by the Tangents to theſe Circles on the Sphere, is equal to the Angle C F D, made by the projected Tangents on the Plane of the Projection. Draw B Q parallel to E F, and joyn A Q.

For the Angle D B A $\overset{(a)}{=}$ A Q B, $\overset{(b)}{=}$ A B Q $\overset{(c)}{=}$ B F D $\overset{(d)}{=}$ D B F. Theref. B D $\overset{(e)}{=}$ D F.

Then in the Triangles C D F, C D B, C D, D[illegible] = C D, D B, and the Angles C D F, and C D B, both Right. Therefore G F D $\overset{(f)}{=}$ C B D. *q. e. d.*

(*a*) By 32. 3. *Euclid.*
(*b*) 21. 3.
(*c*) 29. 1.
(*d*) *Ax.* 1.
(*e*) 6. 1.
(*f*) 4. 1.

Another Demoſtration *by Mr.* Halley.

Let E B P L, be any great Circle of the Sphere, E the Eye placed in its Circumference, C its Center, P any point thereof; and let F C O be ſuppoſed a Plane erected at Right Angles to the Circle E B P L, on which F C O the Sphere is to be projected. Draw E P croſſing the

Plate IX. *Fig.* I.

Plane FCO in *p*, and *p* ſhall be the Repreſentation of the point P; to the point P, draw the Tangent APG, and on any point thereof, as A, erect a Perpendicular AD, at Right Angles, to the Plane EBPL, and draw the Lines PD, AC, DC: Then the Angle APD ſhall be equal to the Spherical Angle contain'd between the Planes APC, DPC; draw alſo AE, DE, interſecting the Plane FCO, in the points *a* and *d*, which will be the Repreſentation of the points A, and D; join *ad*, *pd*. I ſay the Triangle *adp*, is ſimilar to the Triangle ADP, and the Angle *apd*, equal to the Angle APD.

Draw PL, AK, parallel to FO, and by reaſon of the Parallels *ap*. *ad* :: AK. AD. but (by the 32*d*. of the *third* of *Euclid*) in the Triangle AKP, the Angle AKP = LPE = APK = EPG: Therefore the Side AK = AP. and *ap*. *ad* :: AP. AD. Hence (the Angles DAP, *dap*, being Right) the Angle APD = *apd*; that is, The Spherical Angle on the Surface, is equal to that on the Projection. *q. e. d.*

PROP. VI.

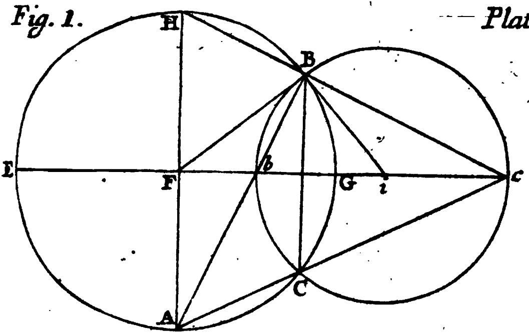
All leſſer Circles whoſe Poles lie not in the plane on which the Projection is to be made, are projected, by laying off in the Line of Meaſures from the Center, the Tangent of half the Diſtance of each Extremity of the Diameter from that Pole (of the Circle on which the Projection is made) oppoſite to the Eye, and the Diſtance of theſe two projected Extremities biſſected will be the Center of the Circle in the Projection.

For Example.

In *Plate* VII. *Fig.* II. Suppoſe BC, to be ſuch [illegible]r Circle; Lay off F*b* equal to the Tangent of half the Arch HB, and F*c* equal to the Tangent of half the Arch HC; this Diſtance *bc* being biſſected, ſhall give the Center of that Circle in the Projection. The

Rea-

Fig. 1.



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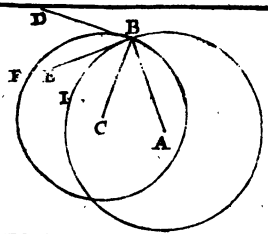

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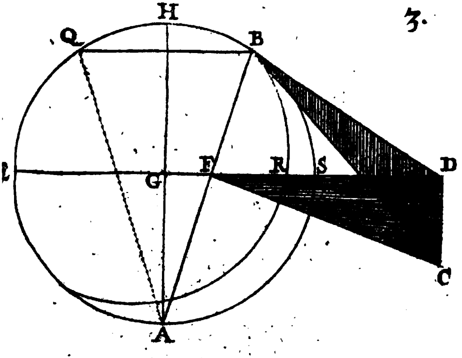


Reaſon of this is evident from what hath been ſaid in the *Demonſtration* of the *firſt Propoſition.*

PROP. VII.

All great Circles (as *Plate* VII. *Fig.* IV.) paſſing through the point *b*, ſhall have their Centers in the Right Line *i* L produced; which Right Line *i* L, is at right Angles to the Line of Meaſures E G, paſſing through *i*, the Center of the Circle A *b* H, which cuts the Line E G, or its Repreſentative Semicircle, at Right Angles.

For all great Circles paſſing through *b*, ſince they will cut again at a Semicircles Diſtance, muſt paſs through the projected oppoſite point, that is through *e*; therefore 'tis evident their Centers will be in the Line *i* L produced, if need be.

PROP. VIII.

If it were required to draw a Circle which ſhall paſs through the point *b*, and make any given Angle with the Circle A *b* H, ſuppoſe of 20 *deg.* Lay off *i k*, equal to the Tangent of 20 *deg.* to the Radius *i b*; I ſay, the point *k* is the Center required.

For draw the Line *k b*, and deſcribe the Circle *b* R *e*.

Then by the *fourth Prop.*

The Angle A *b* R = *i b k*. = 20 *deg.*

COROL.

Since it has been proved in the *fifth Propoſition*, that the Angles made by the Circles on the Plane of the Projection, are equal to the Angles made by their Repreſentatives on the Surface of the Sphere: It will therefore follow, That if *b* was the projected Pole of the World; A b L the Projection of the Six a Clock Hour-Circle, and it were Required to project all the other Hour-Circles, which make Angles of 15, 30, 45 *deg.* &c. with that Six a Clock Hour-Circle; 'tis but putting off in the Line *i* L, from *i*, on both ſides the Tangent of 15, 30, 45, 60, 75. to the Radius *i b*, and you will have the Centers of all thoſe Hour-Circles in ſuch Horizontal Projection.

From what hath been demonſtrated in theſe *Eight Propoſitions*, 'twill be eaſie to project the Sphere in any Poſition: I will now proceed to ſhew how to meaſure any Arch projected, whether Great or Small; in order to which I premiſe theſe *Lemma's*.

LEMMA I.

Plate IX. *Fig.* II.

If a Plane paſs through the Poles of two great Circles ÆQ, and HO, its common Section with the Surface of the Sphere will be repreſented by the great Circle ZPNH; and if the two remoteſt Poles, P and N, be connected by the Right-line PN, and a Plane be ſuppoſed to revolve on this Line PN as an Axis; and let the common Section of this revolving Plane with the Surface of the Sphere be repreſented by the Circle PDKN. I ſay, that this revolving Plane ſhall always cut off equal Arches upon thoſe Circles ÆQ, HO, whoſe Poles are thus connected between it ſelf PDKN, and the great Circle ZPNH; that is, the Arch DO = Arch KQ. And likewiſe from any two parallel Circles, *h o*, and *æ q*, equally diſtant from the ſaid Poles N and P. that is, *d o* = *k q*.

For PO = NQ, and the Angle OPD = QNK, it being the Angle of the Inclination of the two Planes, and the portion of the leſſer Circle PD = NK; Therefore theſe two Triangles being in all caſes qualified alike, will be equal; and therefore DO =

=KQ; and for the ſame Reaſon the Triangles *o* P *d* and *q* N *k* are equal, and conſequently *d o*=*k q*. Q. E. D.

LEMMA II.

If a Plane paſs through the Poles of two great Circles, Æ Q and H O, its common Section with the Surface of the Sphere will be repreſented by the great Circle Z P N H; and if the two neareſt Poles, N and *p*, be connected by the Right-line N *p*, and a Plane be imagined to revolve on this Line N *p*, as an Axis, 'tis plain that its common Section with the Surface of the Sphere will be a Circle, and is repreſented by the Circle *p*, *i*, *r*, *s*, *t*, *f*, *m*, *n*, *t*, N. I ſay, this plane ſhall always cut off equal Arches in thoſe great Circles Æ Q, H O, whoſe Poles are thus connected, and from any other parallels to them, *a q*, *b o*, equally remote from *p*, and N, between it ſelf *p s*, *t*, *m*, *f*, N, and the great Circle Z P N A; but on the contrary ſide, that is, Æ S = M O. *a t* = *f o*. *b r* = *n q*. H *i* = *t* Q. For the Triangles *p* Æ S and N O M, *p a t* and N *o f*, *p b r* and N *q n*, *p* H *i* and N Q *t*, may, as before, be ſhewn to be exactly qualified alike. And therefore, &c. Q. E. D. *Plate* IX. *Fig.* III.

I now proceed to give ſome Inſtances in the Actual projection of the Globe upon the plane of the Horizon, and of the ſeveral ways of Meaſuring the Arches in the Projection ſo projected; Depending on the two foregoing *Lemma's*.

Suppoſe I would project the Surface of the Sphere upon the Plane of the Horizon, for the Latitude of 51 degr. 30 min. *Plate* X.

Deſcribe the Circle N E S W, repreſenting the Horizon; through Z, the Center, draw the Line S Z N, and E Z W, at right Angles; the firſt repreſenting the Meridian of the place, or North and South Azimuth; the other, the prime Vertical or Azimuth of Eaſt and Weſt. Now becauſe the Northen pole of the World is diſtant from the Zenith (or oppoſite pole to which the Eye is placed) 38 *deg.* 30 *min.* Lay off the Tangent of its half, *viz.* 19 *deg.* 15 *min.* in the Line of Meaſures S N, from Z to *p*; then will *p* be the Repreſentation of the Northern pole of the World, by the *Eighth Propoſition*, and the Circle which paſſes through the points E *p* W, will be the Repreſentation of the Hour-circle of Six; and its Elevation above the plane of the Projection being equal to the Elevation of the Pole, *viz.* 51 *deg.* 30 *min.* Lay off in the Line of Meaſures, Z T, the Tangent of that Circles Elevation: Then will T be the Center of that Circle, by the *ſecond Propoſition*; then deſcribe the Circle E *p* W.

Now to deſcribe the Equator, whoſe Diſtance from the Zenith is 51 *deg.* 30 *min.* Take the Tangent of its half, *viz.* 25 *deg.* 45 *min.* to the Radius Z W (which you may eaſily have by the help of a Sector) and ſet it off in the Line of Meaſures from Z to *æ*, and the Equator ſhall paſs through the Meridian N S, in the point *æ*.

Now the Elevation of the Equator being always equal to the Complement of the Latitude, which in this caſe is 38 *deg.* 30 *min.* Take the Tangent of its Elevation, and put it off in the Line of Meaſures from Z to X. Then ſhall X be the Center of the Equator. Then deſcribe the Circle E *æ* W, which you may compleat in an occult Arch, for a Uſe hereafter to be mentioned.

Now for Drawing the Tropic of *Cancer*. Take the Tangent of half its neareſt and greateſt Diſtance from the Zenith, and put it off in the Line of Meaſures from Z to *n*, and from Z to *r*; the Diſtance *n r* being biſſected, the point of Biſſection ſhall be the Center, by the *ſixth Propoſition*. Then deſcribe the Circle ♋ *n* ♋, which compleat in an occult Arch for farther Uſe.

Plate 9th

fig. 1

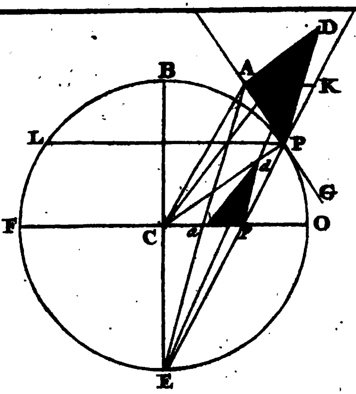


fig. 2

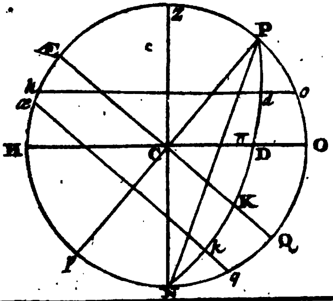
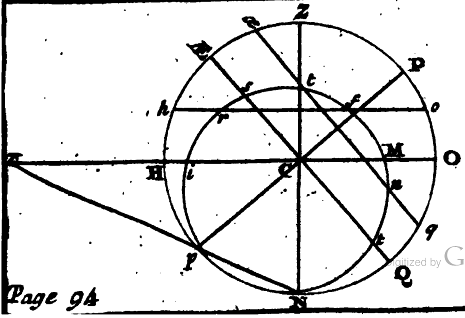


fig. 3



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After the ſame manner deſcribe ♑ *s* ♑, the Tropic of *Capricorn*: And the like Method uſe for the Deſcription of any other parallels to the Equator.

Now to draw the Hour-circles, which make Angles of 15, 30, 45, &c. with the Hour-circle of Six, it hath been ſhewed in the *Cor. 8th. Propoſition*, that their Centers will all lie in the Line P T P, which is perpendicular to the Line of Meaſures paſſing through the Center of the Hour-circle of Six: And that the Center of any Circle paſſing through the point *p*, and making an Angle therewith, was to be found by laying off in the Line T P, the Tangent of that Angle, to the Radius *p* T. Therefore put off in the Line T P on both ſides the Tangent of 15, 30, 45, &c. and you'll have the Centers of all the Hour-circles. But to avoid confuſion of Lines in the Scheme, I have only put off the Tangent of 30 *deg.* from T to *t*; and thereby deſcribed one of them, *viz.* the Hour-circle of Four in the Afternoon.

Now if 'twere requir'd to divide W*æ*, which repreſents the Quadrant of the Equator, into its Degrees; Lay your Ruler upon *p*, the projected Northern pole of the Equator, and the equal Diviſions of the Quadrant of the Horizon W S. for inſtance, upon 30 and 60 *deg.* and the Ruler ſhall cut the Quadrant of the Equator W *æ*, in the points 30 and 60. So that *æ* 30, repreſents 30 *deg.* *æ* 60, repreſents 60 *deg.* and the like for any intermediate Degrees.

Or a Ruler laid upon (or a Line drawn from) *π*, the projected Southern pole of the World, and the equal Diviſions of the Quadrant of the Horizon W N, ſhall paſs through the ſame points 30, 60, &c. in *æ* W, the Repreſentative of the Weſtern Quadrant of the Equator.

Now the Reaſon of this will be evident, for in this Projection the Eye is ſuppoſed in the Under pole of the Horizon or Nadir, and a Line drawn from the Eye to the Northern pole of the World, paſſes thro' the Line of Meaſures, S N in *p*, the Repreſentation of that Northern pole. Let this imaginary Line which paſſes from the Eye to the real Northern pole, be the Line that connects the two remoteſt poles of the Equator and Horizon according, to the *firſt Lemma*; and imagine a plane to revolve upon that Axis; this plane ſhall according to this *Lemma*, cut off equal Arches in thoſe great Circles whoſe poles are thus connected between it ſelf and the Meridian N S, which paſſes through the two poles of the Horizon, and two poles of the Equator. Now the Eye in the Nadir is in the plane of this revolving plane; and therefore by the *third Corollary* of the *firſt Propoſition*, the Repreſentation of that Circle which is the common Section of this revolving plane with the Surface of the Sphere, will be repreſented to the Eye in the common Section of this revolving plane, with the plane of the Projection; that is, (if this plane paſſes through 30 in the Quadrant S W) in the Line p, 30. if it paſſes through 60 *deg.* in the Quadrant S W, the common Section is p, 60. therefore *æ* 30, in the Equator is equivalent to S 30, in the Horizon, &c. For this revolving plane always cuts the Line of Meaſures in p, the projection of the Northern pole.

But when I divide the Quadrant *æ* W, by Lines drawn from π, the projection of the Southern pole to the equal Diviſions of the Quadrant W N. The Line upon which the Revolution of the plane is made, is a Right-Line drawn from the Eye ſuppoſed in the Nadir, to the Southern pole, and produced till it meet the Line of Meaſures N S produced in π, the Repreſentation of the Southern pole; but by the *ſecond Lemma*, a plane that revolves upon this Line, cuts off equal Arches in the Quadrant of the Equator *æ* W, and Quadrant of the Horizon W N. And therefore a Line drawn from π to 30, in the Quadrant N W, ſhall paſs through 30 in the Repreſentation of the Quadrant of the Equator *æ* W.

Now to

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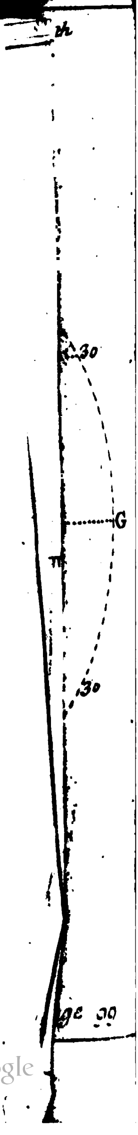
Now thoſe Parallels A B C D, *a b c d*, which were drawn for the Diviſion of the Tropic of *Cancer*, will divide the Tropic of *Capricorn*, *viz*. Lines drawn from *p*, to the equal Diviſions of the Semicircle *a b c d*, will divide the Tropic ♑ *s* ♑.

Or Lines drawn from *x*, to the equal Diviſions of the Arch F C H, will do the ſame. I have omitted drawing them, leaſt I ſhould two much perplex the Scheme. The ſame is to be underſtood of any other two Parallels equally diſtant from the Æquator, or any other Circle. For having firſt drawn two Parallels to the Horizon, or other Circle on which the Projection is made, by the fore-mentioned Rules, that are neceſſary to meaſure one of your parallel Circles, by Lines drawn from both Poles: The ſame two Parallels will ſerve to meaſure or divide the other parallel Circle at an equal Diſtance. Only here obſerve (as in the Diviſion of the Tropic of *Capricorn*) that that Parallel to the Horizon, which ſerved to divide the firſt Parallel from the projected North-pole, muſt be uſed to divide the Parallel at an equal Diſtance from the projected South-pole.

The Equator *W æ*, beſides the former Ways given for its Diviſion, may be thus divided; Suppoſe the Semicircle F G H, was divided into 180 equal Degrees, a Ruler laid upon any of theſe Diviſions, and the projected Northern-pole, as ſuppoſe from 60, or *v*, in the Quadrant G H, to *p*, it ſhall cut the Equator *æ* W, in 60. which I thus demonſtrate.

Let the Lines 60 *p* 60, 60 X, Z 60, be drawn, as alſo X E, and *p* E. Now becauſe that Z X, is the Tangent of the Elevation of the Equator above the Horizon, *viz*. 38, 30. and Z *p*, the Tangent of half that Angle: Therefore in the Triangle E Z X, the Line E *p*, divides the Angle Z E X, into two equal parts. Therefore by the *third* of the *ſixth* of *Euclid*, the Line Z X is divided in the point *p*. So that Z *p*. *p* X :: Z E. E X. but Z E = Z *y*, and E X = X *v*. Therefore Z *p*. *p* X :: Z *y*. X *v*. but the Angle *v p* X = Z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$=Zpy$. Therefore by the *ſeventh Propoſition* of the *ſixth* of *Euclid*, the two Triangles pXv, and pZy, are ſimilar; And therefore the Angle $pXv = pZy$. In each of which, taking away a Right Angle, the Remainder HXv, and yZW, are equal: And conſequently their compliments GXv, and YZS are equal: And therefore this Method gives the ſame Point 60, in the Equator αW; as if a Line had been drawn from the Pole p, to the point 60, or y, in the Quadrant of the Horizon SW. Or draw Lines from any of the Diviſions in the Semicircle FGH, to π, the projected Southern Pole, ſhall divide the Equator. For inſtance; Lines drawn from 30, 60, 90, in the Quadrant FG, to π, paſs through the Points 30, 60, 90, in the Quadrant of the Equator αW, as you may ſee in the Scheme, and may be demonſtrated by a Demonſtration more eaſie than the former.

The Tropic of *Cancer* may be divided likewiſe as the Equator was, *viz*. by dividing the Semicircle $\alpha r \beta$, into 180 Degr. and drawing Lines from thoſe Points through the Point p, and they will divide the Tropic of *Cancer*. Or Lines drawn from thoſe Points to π, the Southern-pole, will do the ſame; as you may ſee in the Scheme; Lines drawn from the Points 30, 60, 90, in the Quadrant $r\beta$ to π, paſs thro' the Points 30, 60, 90, in the Tropic of *Cancer*. The ſame Method may be uſed for the Diviſion of any Parallels; The Demonſtration being like the former, I therefore omit it.

OF THE
Orthographic Projection
OF THE
SPHERE.

Orthographic Projection ſuppoſes the Eye Perpendicular to a plane paſſing through the Center of the Sphere, poſited in a Perpendicular to that Plane erected from the Center, but at an *infinite diſtance*; or which comes to the ſame thing, *ſuppoſes that there were* Perpendiculars let fall from each Point in the Circles to be projected to the Plane, on which the Projection is to be made: Theſe projected points will fall in Right-lines on the plane, when the Circles (great or ſmall) to be projected, are Perpendicular to the plane of the Projection, but if *Oblique*, in *Ellipſes*. So that you may have as great variety of theſe ſorts of Projections, as on the *Stereographic*. But they being more troubleſome, by reaſon of the Oblique Circles being projected in Ellipſes; Mathematicians have confined themſelves to the moſt ſimple of theſe kind, *viz.* upon the plane of the Solſticial Colure, commonly called the *Planiſphere* or *Analemma*, which is admirably uſeful and eaſie; I ſhall here give you a ſhort account of it.

In *Plate* 11th. *Fig.* 1ſt. the Circle ZHNO, repreſents the Solſticial Colure, or Meridian paſſing thro' the 1ſt points of ♋ and ♑, the Center A repreſents the Eaſt or Weſt point of the Horizon.

HAO the Horizon, its Axis ZAN, repreſents the the Azimuth of Eaſt or Weſt, or 90th Azimuth.

ÆA*æ* is the Equinoctial, its Axis PA*p*, repreſents the 6th Hour Circle.

♋A♑ repreſents the Ecliptic, ♈A♎, its Axis, repreſenting a Circle paſſing through the Equinoctial points ♈ and ♎.

OP the heighth of the Pole, whoſe compliment HÆ =ZP, is the height of the Equinoctial.

Suppoſe the Sun's place to be in ♊ 0 *deg.* or ♌, 0 *deg.* or in ♐ 0, *deg.* or ♒ 0 *deg.* theſe points are all diſt. from the Equinoctial points, (both which are projected in A) 60 *deg.* therefore take the ſine of 60 *deg.* and put it off in the line A♋, and A♑, from A, both ways to ☉,☉; theſe points ſhew the place of the Sun for the given times. *Viz.* That in the Quadrant, A♋ for the Summer, and that in the Quadrant, A♑ for the Winter; and through the point ☉, draw a Parallel to the Equinoctial D*d*, δδ, which is the projection of the Sun's parallel for that Day.

Hence it appears, that the Sun that day Riſes or Setts in the point M or *m*, Culminates at Noon in D or δ, Comes to the 6th Hour in T, is due Eaſt or Weſt in Q, therefore AM, or A*m* is the Sine of the Sun's Amplitude, T☉ is the like Right Aſcenſion of the Sun, that is, T☉ contains as many degrees as the Right Aſcenſion, had it been meaſured in the Equator, and therefore a like Arch MD or Mδ the Semidiurnal Arch of the Sun, MT or *mt* the Aſcenſional difference, to be Numbred from the next Cardinal Point backward or forward.

Suppoſe the Sun's height were taken by a Quadrant or other Inſtrument, put that Altitude from H to L, and draw LX*l* Parallel to the Horizon, cutting the Parallel of Declination D*d* in S, and the Axis of the

Horizon in X, S will be the place of the Sun in the Analemma for that inſtant. Wherefore S T ſhall be the like diſtance of the Sun from the 6th Hour Circle, S X its like diſt. from the 90th Azimuth, whence may be found in theſe Parallels, both the Hour at which the Obſervation was made, and Azimuth from the Meridian.

Thoſe Arches of leſſer Circles (which I call like Arches) may proportionally be transferred to their greateſt Parallel in this manner: As the Semidiameter of the leſſer Parallel, is to the like diſtance; So is the Semidiameter of the Circle Z H N O, to the Sine of the true diſtance from the Center. For Inſtance, in the like Aſcenſional difference T M. to the end of the Parallel T M *d*, draw a Semidiameter A *d*, and within the Triangle A T *d*, draw from M, the Right ſine M π, parallel to A T; Then T *d*. T M :: A *d*. A π, make A F = A π, then is A F the ſine of the Aſcenſional difference, by which the Semidiurnal Arch is more or leſs than 6 Hours.

Hence it is eaſie to deſcribe the Ellipſis that ſhall paſs through the given point M, in any Ratio of the Semitranſverſe A O, to the Semiconjugate A M. Thus,

> Make A O. A M :: X *l*. X G :: *q* P. *q y*, the Curve line, drawn with an even hand through the points Z *y* G M, ſhall be the Ellipſis Required.

Or thus by your Sector, Take A O in your Compaſſes, and open your line of Sines to it, then take A M and apply it to your line of Sines, and obſerve what Angle 'tis the Sine of; then draw as many Occult Parallels to A O as you pleaſe, and making each of them Rad. ſucceſſively, lay of the Sine of the Angle you obſerved A M to be the Sine of, and do ſo ſucceſſively, a line drawn through theſe Points ſhall be what was deſired.

Stereographic Problems,

In order to the Projection *of the ſeveral Caſes in* Spheric Triangles.

PROB. I.

To find the Pole of any great Circle Projected.

NOTE that the Pole of any great Circle is the repreſentation of that point of the Surface of the Globe (on the Plane of the Projection) which is 90 *deg.* diſtant from that Circle.

Theſe Circles are of three kinds, either 1. the *Primitive Circle* A B C D, the plane of which is the plane of the Projection. *Plate* XI. *Fig.* II.

2. A *Right Circle* (or the projected repreſentation of a great Circle perpendicular to the plane of the Projection) the Eye being in the plane of which, will on the projection be repreſented by a Diameter, as B D or A C.

3. *An Oblique Circle*, (or the projected repreſentation of a great Circle not perpendicular to the plane of the Projection) which will be always repreſented by an Arch, ſuch as B F D; the points of interſection of this Arch, with the primitive Circle, (being connected) will always paſs through the Center of the primitive Circle.

For this Arch BFD is the repreſentation of a Semicircle Elevated above the plane of the Projection; and ſince two great Circles cut one another at a Semicircles diſtance, their common Section will be a Diameter, and here repreſented by the Diameter BD.

Caſe I.

To find the Pole of the Primitive Circle, ABCD.

RULE.

Find its Center E, by the 1ſt *Prop.* of the 3d Book of *Euclid*, which point E, is the Pole.

Caſe II.

To find the Pole of a Right Circle, ſuppoſe BD.

RULE.

Croſs that Diameter with another Diameter AC at Right Angles, the two Extremities A and C are the Poles of the right Circle BD. Or the Chord of 90 *deg.* ſet off from B both ways, will determine the Points A and C.

Caſe III.

To find the Pole of an Oblique Circle.

Note that the Pole of an Oblique Circle is in that Diameter of the primitive Circle, which paſſes through the Center of the projected Oblique Circle.

EXAMPLE.

$$\left.\begin{array}{l}\text{ABCD the Primitive}\\ \text{BFD the Oblique.}\end{array}\right\}\text{Circle and}\left\{\begin{array}{c}\text{E}\\ \text{C}\end{array}\right\}\text{their Centers given.}$$

To find the Pole of the Oblique Circle BFD.

1. Through E and G, draw the Diameter AEC, cutting the primitive Circle in A and C, and the Oblique Circle in F.

2. A Ruler laid on D and F, will cut the primitive Circle in *a*.

3. Take 90 *deg*. from a Scale of Chords, and put it off in the primitive Circle from *a* to *b*.

4. A Ruler laid on D, and this point *b* will cut the Diameter AEC in G, the Pole required; which point G is the projected Pole that lyes above the Plane of the projection, but if the projected under Pole had been required, lay off the Chord of 90 *deg*. from *a*, the contrary way to *c*, A Ruler laid from D to *c*, will cut the Diameter AEC produced in the point γ, the projected under Pole.

PROB. II.

To lay down on the Projection any Angle required.

DEFINITION.

A Spherical Angle is made by the Intersection of 2 great Circles on the Surface of the Sphere, and is measured by that Arch of a great Circle which is 90 *deg*. from this point of Intersection, intercepted between the Legs or Arches that constitute the Angle. It hath been proved in the 5*th* Proposition of Stereographic Projection, that the Angles of the plane of the Projection, are equal to the Angles they represent on the surface of the Globe.

In this Problem there are three Cases. either

1. Where the Angular point is at the center of the primitive Circle.

2. Where the Angular point is in the Periphery of the Primitive Circle.

3. Where the Angular point is in any point given within the Periphery, and not in the Center.

Caſe I.

To make an Angle where the Angular point is in the Center of the Primitive Circle,

RULE.

Such Angle is made in all reſpects like a plane Angle, *viz.* by drawing 2 lines from the Center, ſo that the Arch of the Primitive Circle intercepted between them, be equal to the degrees of the Angle propoſed.

Caſe II.

To make an Angle, that the Angular point may be in a point given in the Periphery.

Plate XI. *Fig.* II. For Example, to make the Angle H A D, having its Angular point in the Periphery at A of 36 *d.* 00 *'*.

RULE.

The Primitive Circle A B C D *being deſcribed.*

1. Lay a Rule on E, the primitive Circles Center, and the given point A, which will likewiſe cut the primitive Circle in C.

2. With the Secant of the given Angle 36 *deg.* and one Foot of the Compaſſes in the given point A, deſcribe the Arch X.

3. With the ſame opening of the Compaſſes, and one Foot in C, croſs the former Arch, X in X. X is the Center of the oblique Circle A H C, ma-

king an Angle with the Primitive Circle of 36 *deg.* as is evident by the *Coroll.* 2 *Propoſition.* of *Stereographic Projection.*

Caſe III.

To make an Angle, where the Angular point is in any point given within the Periphery, but not in the Center.

EXAMPLE.

ABCE the primitive Circle
E its Center } given.
G the Point

To deſcribe an Angle at the Point G, of 45 deg.

RULE.

1. Through G and E, draw the Diameter A E G C.
2. Croſs it at Right Angles with the Diameter B D.
3. Lay a Ruler on D and G, and it will cut the Primitive Circle in *b*.
4. Take the Tangent of the arch C *b*, and put it off in the line A C, from E to A.
5. Erect a perpendicular A *g* continued.
6. Lay off the Tangent of the Compliment of the Angle requir'd from A, either way to *g*, which Compliment is in this Caſe 45 *deg.*
7. Upon the Point *g* with the diſtance *g* G, deſcribe the Circle G *a*; the Angle A G *a*, is the Angle required.

This follows from the 8th Propoſition of *Stereog. Project.*

PROB. III.

To draw a great Circle through any given point, making with the Primitive Circle any given Angle.

RULE.

1. With the Tangent of the given Angle, and one Foot in the Center deſcribe an Arch.
2. With the Secant of the ſame Angle, and one Foot in the given point, ſtrike an Arch croſſing the former; the Interſection of which Arches is the Center of the Circle required.

EXAMPLE.

Plate XI.
Fig. II.

A B C D the primitive Circle
E the Center thereof
I the point given.

Through the point I, 'tis required to draw an Oblique Circle, ſo that it may make an Angle at the primitive Circle of 36 *deg.*

1. With the Tangent of 36 *deg.* and one foot in the Center, deſcribe the Arch X.
2. With the Secant of this Angle, and one foot in the given point I, make an Arch cutting the Arch X in X, X is the Center of the Oblique Circle A H C, making with the primitive Circle the Angle required.

The reaſon of which is evident from the 2d Propoſition of *Stereog. Projection.*

PROB. IV.

To draw a great Circle paſſing through any 2 points given within the Periphery of the Primitive Circle,

RULE.

1. Through any one of the given points and the primitive Circle's Center, draw a Diameter produced beyond the Periphery.
2. Croſs this Diameter at Right Angles.

Plate 11.

Fig. 1.st

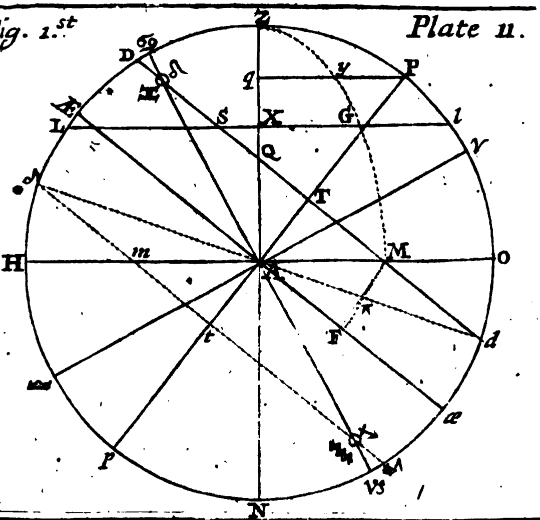
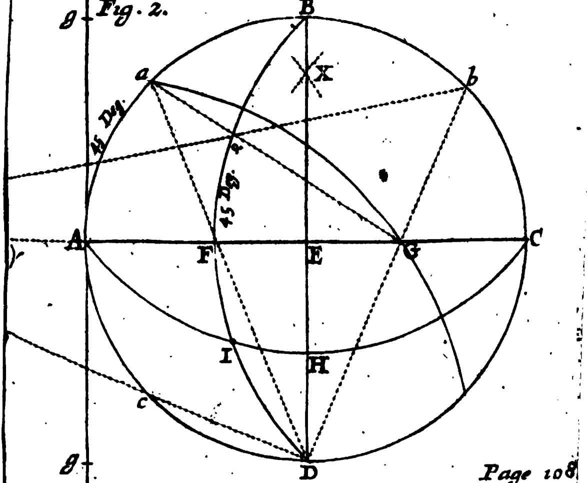


Fig. 2.



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3. Through the point mention'd, draw a line to the Extremity of this ſecond Diameter.

4. At the end of this line in the Periphery of the primitive Circle, erect a Perpendicular cutting the firſt Diameter in a third point.

5. Through the 2 points given, and this third point ſtrike a Circle, and it ſhall be the great Circle required; by *Prob.* 8. of *Geomet. Probl.*

EXAMPLE.

ABCD the primitive Circle } Given. *Plate* XII. *Fig.* I.
A its Center
F and G the two points

Through F *and* G, *'tis required to draw a great Circle.*

1. Through E and F draw the Diameter A F E C I.

2. Croſs it at Right Angles with the Diameter B D.

3. Draw a line either from F to B, or from F to D.

4. To either of which lines F B or F D, at the Extremities B or D, erect the Perpendiculars B I or D I, interſecting the Diameter A C produced in I, the 3d point.

5. Through theſe 3 points F, G, and I, deſcribe the Circle K F G H, and 'tis done.

We here have nothing to prove, but that the line H K, that connects the 2 Interſections with the primitive Circle, paſſes through the Center, for then 'tis the repreſentation of a great Circle.

DEMONSTRATION.

F E, E B :: E B, E I; the Triangles F E B and B E I being ſimilar by the 8th Prop. of the 6th of *Euclid*, and H E continued will fall upon K, the other interſection; for if it's poſſible to do otherwiſe, let it fall upon on M, and produce H E M to L, then by the 35th of the 3d of *Euclid.* E F. E H :: E L. E I, and conſequently E H x E L = A D q = E H x E K = E H x E M, and by conſequence E M = E L; that is, the part equal to the whole; which is abſurd. *Q. E. D.*

PROB. V.

To draw a great Circle perpendicular to a given great Circle,

General Rule.

Draw a great Circle through the Pole of the given great Circle, and it will be perpendicular to a great Circle given. In this Problem are 4 Caſes, either

1. Perpendicular to the primitive Circle.
2. A Right Circle perpendicular to a Right Circle.
3. An Oblique Circle perpendicular to a Right Circle.
4. An Oblique Circle perpendicular to an Oblique Circle.

Caſe I.

To draw a Circle perpendicular to the primitive Circle given,

RULE.

Through the Center of the primitive Circle draw a Diameter and 'tis done; for the Center of the primitive Circle is its Pole.

Caſe II.

To draw a Right Circle perpendicular to a Right Circle given.

RULE.

This is done by Drawing a Diameter, perpendicular to the Diameter or Right Circle given.

Caſe III.

To draw an Oblique Circle perpendicular to a Right Circle given,

RULE.

1. Find the Poles of the given Right Circle, by Prob. the 1*ſt*, Caſe the 2*d*. of *Stereog. Prob.*

2. Draw a Circle through thoſe two Poles.

EXAMPLE.

A B C D the primitive Circle E its Center B E D a Right Circle	Given.	*Plate* XI. *Fig.* II.

'Tis required to draw an Oblique Circle perpendicular to the Right Circle B E D given.

1. Croſs the Right Circle given B E D, with the Diameter A C, or lay the Chord of 90 *deg.* from B to A and C, which are the 2 Poles of the Right Circle B E D.

2. With any diſtance and one foot in A and C, ſtrike 2 Arches croſſing one another in X. X ſhall be the Center, and A H C, the Circle requir'd.

But here obſerve, that if the Oblique Circle required to be drawn, were ſo limited as to make a given Angle with the primitive A D C.

Then take the Secant of that Angle in your Compaſſes, and placing your Compaſſes in A and C, make 2 Arches croſſing one another in X; X ſhall be the Center. Or take the Tangent of that Angle and ſet it off in the Right Circle (or Diameter) B D, from the Center E to X, and 'tis done.

But if the point H be given, through which this Obliqne Circle ſhould paſs, without any relation to the Angle it ſhould make with the primitive Circle, (though that be Virtually given) a Circle ſtruck thro' the 3 Points A, H, and C, will anſwer the Demand.

Caſe IV.

To draw an Oblique Circle perpendicular to a given Oblique Circle,

RULE.

1. Find the Pole of the given Oblique Circle, by Prob. 1. Caſe the 3d. of *Stereog. Problems.*
2. Through that Pole draw a great Circle, or which is the ſame, draw ſuch an Arch as may paſs thro' the Pole ſo found, and may interſect the Primitive Circle in points diametrically oppoſite.

Plate XII.
Fig. II.

EXAMPLE.

A H C G the primitive Circle } given. { I } their
A B C an Oblique Circle } given. { Y } Centers.

'Tis required to draw an Oblique Circle perpendicular to the Oblique Circle A B C given.

1. To find E the Pole of the Oblique Circle given by Prob. 1ſt. Caſe 3d.
2. Lay a Ruler over the Center I, any-wiſe, cutting the Primitive Circle in D and G, a Circle ſtruck through the three points D, E and G, ſhall be the great Circle required.

But here obſerve, that if the point K (in the given Oblique Circle) be given, then draw a great Circle through the 2 Points E and K, by the 4th Problem. And if it be required that the Circle paſſing through the Pole E, ſhall alſo make a given Angle with the Primitive Circle, it may be done by the 3d. *Prob.*

PROB. VI.

To lay any quantity of Degrees on a great Circle.

In this Problem are three Caſes.

1. On the Primitive Circle.
2. On a Right Circle.
3. On an Oblique Circle.

Caſe I.

To lay off any number of Degrees on the Primitive Circle,

RULE.

Take from your line of Chords (to that Radius) the number of degrees you would lay off, and tranſferr it to the Primitive Circle, and 'tis done. This needs no Example.

Caſe II.

To lay off any number of Degrees on a Right Circle,

RULE.

Take the Tangent of half the Angle you would lay off, and put it off in the Right Circle from the Center, and 'tis done.

EXAMPLE.

Plate XI.
Fig. II.

ABCD the Primitive Circle, E its Center } given.
AEC the Right Circle }

On this Right Circle AEC, 'tis required to lay off rom the Center E 45 *deg.*

Take the Tangent of its half, *viz.* 22 *d.* 30′, and ay it off from E to F, then ſhall EF repreſent 45 *deg.*

Or from the Scale of half Tangents take 45 *deg.* and it will reach from E to F.

Or take the Chord of 45 *deg.* and lay it off in the Semicircle A B C, from B to *a*, a Ruler laid from D to *a*, will cut the Right Circle in F, ſo that E F ſhall repreſent the Arc *a* B, *viz.* 45 *deg.*

Caſe III.

To lay off any number of Degrees upon an Oblique Circle,

RULE.

1. Find the Pole of the given Oblique Circle, by Prob. 1. Caſe III.
2. Lay the given number of Degrees on the Primitive Circle, by Caſe the 1ſt of this Problem.
3. Lay a Ruler to the extremities of the Arch laid down in the Primitive Circle from the Pole, and it will cut off a like Arch in the Oblique Circle.

Plate XI.
Fig. II.

EXAMPLE.

A B C D the Primitive Circle } their Centers { E }
B F D the Oblique Circle. } are { C. }

'Tis requir'd in the Oblique Circle B F D, to lay off an Angle of 45 *deg.* from F.

1. Through C and E the two Centers, draw the Diameter C E F A, and therein find G the Pole of the Oblique Circle given, by the 1*ſt*. Prob. Caſe 3.
2. From your line of Chords, put 45 *deg*, off in the Primitive Circle, from A to *a*.
3. Lay a Ruler to G and *a*, and it ſhall cut the Oblique Circle in *a*, So that F *a* repreſents 45 *deg.*

The like may be done for any other Number of Degrees, and from any Point.

Or thus, Lay off 45 *deg.* in the oppoſite Semicircle BCD, from C to *b*, a Ruler laid from γ the projected *under Pole*, of the Oblique Circle BFD to *b*, will cut the Oblique Circle given BFD in the ſame Point *a*. So that any Arch or Number of Degrees, may be laid off in any great Circle given, by the means of either Pole; the Demonſtration of this is already given in the Theoretic part of *Stereog. Projection*.

PROB. VII.

To Meaſure any part of a great Circle projected. In this Problem are three Caſes, and are but the Converſe of the former.

Caſe I.

To Meaſure any part of the Primitive Circle,

RULE.

Take the Arch required to be meaſured in your Compaſſes, and apply it to your Scale of Chords and it ſhews you the Degrees; this needs no Example.

Caſe II.

To meaſure any part of a Right Circle.

RULE.

1. Lay a Ruler from the Pole of the Right Circle, to the 2 Extremities of the Portion of the Right Circles, whoſe meaſure you'd know, and it will cut the primitive Circle in 2 points.
2. Take the diſtance of thoſe two Points in your Compaſſes, and apply it to your line of Chords, and it will ſhew you its Meaſure.

Plate XI,
Fig. II.

EXAMPLE.

I would know the meaſure of the portion of the Right Circle F E, a Ruler laid from its Pole D to E, cuts the primitive Circle in B; and laid from D to F, cuts the Primitive Circle in *a*. Take *a* B in your Compaſſes, and apply it to your line of Chords, and it ſhews you the number of Degrees, that E F repreſents, or its meaſure.

The like for any other Portion great or ſmall, whether taken from the Center or not,

Caſe III.

To meaſure any portion of an Oblique Circle,

RULE.

1. Find the Pole of the given Oblique Circle.
2. Lay a Ruler on the Pole to the two Extremities of the Portion, whoſe Meaſure is deſired,
3. The Ruler ſo laid, will cut the primitive in two Points, whoſe diſtance meaſured on the line of Chords, gives what is deſired.

I conceive it needleſs to give an Example, the Rule being ſo plain.

PROB. VIII.

To Meaſure any Spheric Angle,

General Rule.

A Spheric Angle in the Projection, is meaſured by meaſuring that Arch of a great Circle, which is intercepted between the two Arches that contain the Angle, at a Quadrant's diſtance from the Angular Point; that is, the Angular point being the Pole of the Arch, if ſuch an Arch be deſcribed in the Projection; If not, meaſure the diſtance between the two Poles of the

Circles containing the Angle; and that is the meaſure of the Angle required.

In this Problem are Three Caſes.

1. When the Angular point is in the Center of the Primitive Circle.
2. When the Angular Point is in the Periphery of the Primitive Circle.
3. When the Angular Point is within the Primitive Circle, but not in the Center.

Caſe I.

To meaſure an Angle when the Angular point is in the Center,

RULE.

Such an Angle is meaſured by taking the Arch it ſubtends in your Compaſſes, and applying it to your line of Chords

Caſe II.

To meaſure an Angle, when the Angular point is in the Periphery of the primitive Circle.

EXAMPLE. *Plate* XII. *Fig.* III.

A B C D the Primitive Circle } given. } E } their
B P D an Oblique Circle } } X } Centers.

'Tis required to Meaſure the Angle K B H.

Through X and E, draw the Diameter A C.

In this Diameter find x the Pole of the Oblique Circle B P D, the diſtance E x or A P, meaſured by a Scale of half Tangents is the meaſure of the Angle required.

After the ſame manner P E or C x, is the meaſure of the Angle P B E.

Caſe III.

To make an Angle, when the Angular point is within the primitive Circle, but not in the Center.

EXAMPLE.

A B C D the Primitive	Circle, and	E	their Centers given.
D P G B an Oblique		X	
L O G F an Oblique		Y	

'Tis required to meaſure the Angle F G B.

1. Through E and Y, and alſo through E and X, draw 2 Diameters, and in them find *y* and x, the Poles of the two Circles conſtituting the Angle, by Prob. I. Caſe III.
2. Lay a Ruler from G, the Angular point to x and *y*, which ſhall cut the Primitive Circle in *n* and *m*, the diſtance *n m* taken in the Chords, is the meaſure of the Angle required.

The ſame Method is to be taken, if it were required to Meaſure the Angle B H K, conſtituted by a Right Circle and an Oblique, *viz*, A Ruler laid from H, to F and x, the length of the Arch in the Primitive Circle, intercepted between the Points cut by the the Ruler, ſhall be the meaſure of the Angle.

PROB. IX.

To draw a Parallel Circle.

DEFINITION.

Parallel Circles on the Globe, are ſuch which divide the Surface of the Globe into two unequal Parts, and are always Parallel to ſome great Circle. Parallels on the Projection are the Repreſentation of theſe.

In this Prob. are three Caſes; either

1. Parallel to the Primitive Circle.
2. Parallel to a Right Circle.
3. Parallel to an Oblique Circle.

Caſe I.

To draw a Circle parallel to the primitive Circle,

RULE.

This is done by taking the Tangent of half the Parallel's diſtance from the Pole, and therewith (one foot being placed in the Center) deſcribe a Circle and 'tis done

EXAMPLE *Plate* XII. *Fig*. IV.

A B C D the primitive Circle, E its Center.

'Tis required to draw a Circle parallel to the primitive, and 30 *deg*. diſtance from it, that is, 60 *deg*. from the Pole.

Take E F equal to the Tangent of 30 *deg*. and with that diſtance, one foot being placed in E, deſcribe the Circle F G H M, and 'tis done.

Caſe II.

To draw a Circle parallel to a Right Circle,

RULE.

1. From the Chords, lay of the Parallel's diſtance from the Pole of the Right Circle given, both ways, marking the Points.
2. Take the Tangent of that Parallel's diſtance from the Pole, in your Compaſſes, and put one foot in the two Marks before, Noted ſucceſſively, ſtrike

ſtrike 2 Arches cutting one another; the point of interſection, ſhall be the Center of that Parallel.

Or thus, Croſs the Right Circle given with a Diameter at Right Angles, which let be produced; take the Secant of the Parallels diſtance from the Pole, and ſet it off in this Diameter, from the Center on that ſide the Circle ſhould be drawn, and it ſhall give the Center Required.

Plate XII.
Fig IVI.

EXAMPLE.

ABCD the Primitive Circle, E its Center,
BED a Right Circle.

'Tis required to draw a Circle Parallel to the Right Circle BED, at 40 *deg.* diſtance from it, or 50 *deg.* from its Pole C.

1. Lay off 50 *deg.* from C, to K and L.
2. Take the Tangent of 50 *deg.* and placing the foot of the Compaſſes (open'd to that diſtance) in L and K, and ſtrike 2 Arches cutting one another in Y.

Or the Secant of 50 *deg.* (the Parallels diſtance from the Pole) ſet off from E (in the Diameter A C) will reach to Y, the Center required.

Caſe III.

To draw a Circle parallel to an Oblique Circle,

RULE.

From the Scale of half Tangents, lay off the Parallel diſtance from the Pole of the Oblique Circle given, both-ways, in that Diameter of the Primitive Circle which paſſes through the Pole of the given Oblique Circle, then Note thoſe Marks; the diſtance of theſe points Biſſected, gives the Center of the Parallel.

EXAMPLE.

$$\left.\begin{array}{l}\text{ABCD the Primitive}\\ \text{DFB an Oblique}\end{array}\right\}\text{Circle,}\ \left\{\begin{array}{c}\text{E}\\ \text{X}\end{array}\right\}\text{their Centers.}$$

'Tis required to project a parallel to the Oblique Circle D F B, 40 *deg. diſtant from it, or* 50 *deg. diſtant from its pole.*

1. Find G, the Pole of the given Oblique Circle DFB, by Prob. 1. Caſe III.
2. Meaſure E G, by a Scale of half Tangents, (or by a Scale of Tangents, doubling the Angle you find it) and ſuppoſe it to be 34 *deg.* then take the 34 *deg.* + 50 *deg.* = 84, and lay it down by a Scale of half Tangents, from E to *n*, and take 50 *deg.* — 34 *deg.* = 16; lay it off in the line A C, from E to *m*, *m n* is the Diameter of this Parallel; Biſſect *m n* in *o*, *o* is the Center required. Or the Tangent of half 84, *viz.* 42 ſet off from E, will reach to *n*, and the Tangent of 8 *deg.* put off from E, will reach to *m*. Then with the Center *o*, and Radius *o m*, deſcribe the Parallel.

PROB. X.

To meaſure any Arch of a parallel projected.

In this Problem there are three Caſes,

1. When 'tis Parallel to the Primitive Circle.
2. When 'tis Parallel to a Right Circle.
3. When 'tis Parallel to an Oblique Circle.

Caſe I.

To meaſure any Arch of a parallel to the primitive Circle,

RULE.

A Ruler laid from the Pole (or Center of the Primitive Circle) to the equal diviſions in the Periphery of the Primitive Circle, ſhall cut the correſpondent degrees in the Parallel.

Caſe II.

To meaſure any Arch of a parallel to a Right Circle.

Plate XII. *Fig.* IV.

EXAMPLE.

Suppoſe I were to meaſure or divide the Parallel K I L, which is 50 *deg.* diſtant from C, the Pole of the Right Circle D E B.

RULE.

1. Deſcribe a Circle Parallel to the Primitive Circle, as far diſtant from the Pole in which the Eye is, as the Parallel K I L is from C, the Pole of the Right Circle D E B, 50 *deg.* and conſequently diſtant from the oppoſite Pole, in which the Eye is ſuppoſed, 130 *deg.* Take the Semi-tangent of 130 *deg.* (or which is the ſame,) the Tangent of 65 *deg.* and with your Compaſſes open'd to that diſtance, and one Foot in the Center E, deſcribe a Circle..
2. A Ruler laid from C, to the equal Diviſions of that half of this Circle, which is Parallel to the Semicircle B A D, ſhall cut the Parallel K I L. into its correſpondent degrees.

Or a Ruler laid from A, the other Pole of the Right Circle D E B, to the equal degrees of that Semicircle which is Parallel to B C D, ſhall likewiſe divide, or meaſure the Parallel K I L.

Caſe III.

To meaſure any Arch or parallel to an Oblique Circle.

EXAMPLE. *Plate* XII. *Fig.* V.

Suppoſe I were to meaſure, or divide the Parallel *m* R *n*, parallel to the Oblique Circle D F B, and diſtant from its Pole G, 50 *deg.* A Parallel to the Horizon muſt be deſcribed, as much diſtant from the Point or Pole in which the Eye is, *viz.* 50 *deg.* and conſequently diſtant from the oppoſite Pole, in which the Eye is, 130 *deg.* take therefore the Tangent of 65 *deg.* or Semi-tangent of 130 *deg.* and deſcribe ſuch Circles as in the 2d Caſe. A Ruler laid to G, and the equal diviſions of this Circle (Parallel to the Primitive) ſo deſcribed, ſhall divide the Parallel *m* R *n*, into correſpondent Degrees or Parts.

Other Methods for doing the ſame thing, you'll find in what I have ſaid in the Theoretic part of *Stereographic Projection*, to which I referr you.

Note, I have omitted the drawing of theſe Parallels, mentioned in the 2d, and 3d Caſe, ſince they would run beyond the Limits of the reſpective Figures, and becauſe it is ſo very eaſie to conceive them as drawn.

THE Stereographic Projection OF THE *Several Caſes*, in Right Angled *SPHERIC TRIANGES.*

PROB. I.

The two Legs given, to find the two Oblique Angles and Hypothenuſe.

EXAMPLE.

$$\text{Given } \left.\begin{array}{l} BA = 30\,d \\ PA = 25 \end{array}\right\} \text{Required} \left\{\begin{array}{l} \text{Angles} \left\{\begin{array}{l} B \\ P \end{array}\right. \\ \text{Hypothenuſe } BP. \end{array}\right.$$

Caſe I.

Suppoſe the Leg A B be laid off in the Primitive Circle, then through A draw a great Circle at Right Angles to A B, which will be a Right Circle or Diameter; then with the Semi-tangent of 65 *deg.* the compliment of P A (or which is the ſame thing, with the Tangent of its half, *viz.* 32 *d.* 30′) one Foot of the Compaſſes being placed in the Center, deſcribe a Circle Parallel to the Primitive, cutting the Perpendicular A P in P. Laſtly thro' B and P draw a great Circle, and 'tis done.

Plate XIII.
Fig. I.
Caſe I.

To

Plate 12.

Fig. 1.

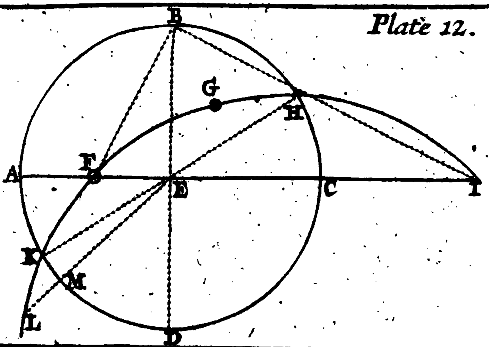


Fig. 2.

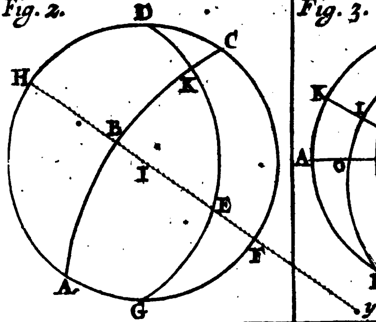


Fig. 3.

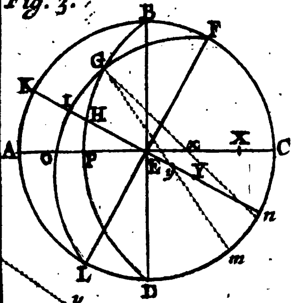


Fig. 4.

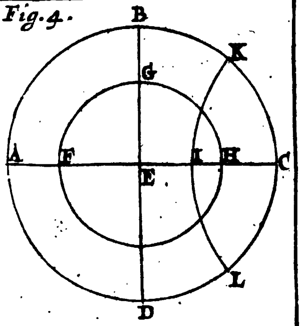
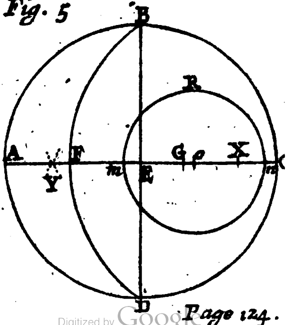


Fig. 5



Page 124.

To meaſure the things required.

The $\left\{\begin{array}{l}\text{Hypothenuſe B P}\\ \text{Angles B, and P}\end{array}\right\}$ are meaſured by Prob. $\left\{\begin{array}{l}7\\ 8\end{array}\right.$

Caſe II.

Suppoſe the Leg B A, *laid down in a Diameter or Right Circle, the point* B *being at the Center.*

The Primitive Circle being drawn, and likewiſe the Right Circle, in which you deſign to lay down B A; from the Center B, take the Tangent of 15 *deg.* (or Semi-tangent of 30 *deg.*) and lay it in the Diameter from B to A; then draw a great Circle, paſſing thro' the Poles of the Arc B A, and the point A, which will therefore be Perpendicular to B A: In this Circle lay off A P = 25 *deg.* by means of its Pole; Laſtly, draw a Diameter thro' P and B, and 'tis done.

Plate XIII.
Fig. I.
Caſe II.

To meaſure the things required,

The $\left\{\begin{array}{l}\text{Hypothenuſe B P}\\ \text{Angles B and P}\end{array}\right\}$ are meaſured by Prob. $\left\{\begin{array}{l}7\\ 8\end{array}\right.$

Caſe III.

Suppoſe the Leg A B, *laid down in a Diameter, or Right Circle, the point* B *being not in the Center, but at any point aſſigned in that Diameter.*

1. By the help of a Scale of half Tangents, lay off B A, to repreſent 30 *deg.*

Plate XIII.
Fig. I.
Caſe III.

2. Then thro' the Poles of the Right Circle given, and the point A, deſcribe a great Circle, which is therefore Perpendicular to B A, and therein meaſure A P = 25 *deg.* by means of its Pole.

3. Laſtly, a great Circle ſtruck through the Points B and P, anſwers the Problem.

The Hypothenuſe and Angles P and B, are meaſured by the 7th and 8th Prob.

Note, that the Leg A B, may be laid down in any Oblique Circle, either from its interſection with the Primitive Circle, or from any point given therein, which I forbear to inſiſt upon, not doubting but the Reader (knowing what was done before) will eaſily apprehend.

PROB. II.

The Hypothenuſe, and one of the acute Angles given, to find the other Oblique Angle, and two Legs.

EXAMPLE.

$$\left.\begin{array}{l}\text{Given, } PB = 60\,d\\ \text{Angle, } P = 50\end{array}\right\}\text{to find}\left\{\begin{array}{l}PA,\\ BA,\\ \text{Angle } B.\end{array}\right.$$

There are ſeveral Varieties, I ſhall only inſtance in two.

Caſe I.

Where the Angle P given, is placed in the Periphery of the primitive Circle.

Plate XIII. *Fig.* II. *Caſe* I. 1. From the point P, deſcribe a Parallel to a Right Circle at 60 *degrees* diſtance.

2. Draw a great Circle thro' P, making an Angle of 50 *deg.* with the primitive Circle, and cutting the parallel in B.

3. thro'

Plate 13.

Fig. 1. Cas: 1st

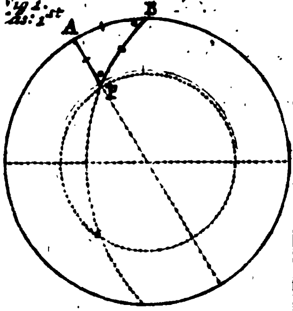


Fig. 1. Case 2d

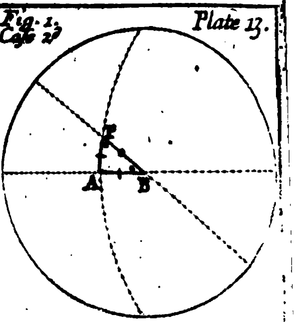


Fig. 1. Case 3

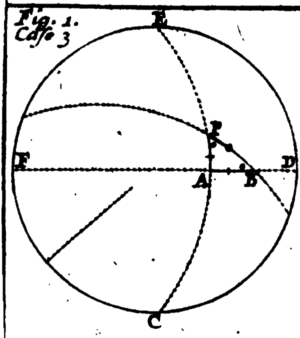


Fig 2d Case 1.

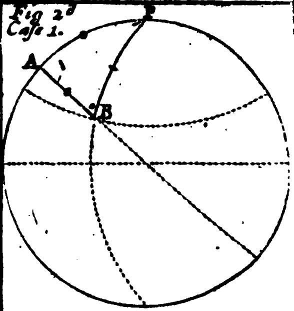


Fig. 2d Case 2d

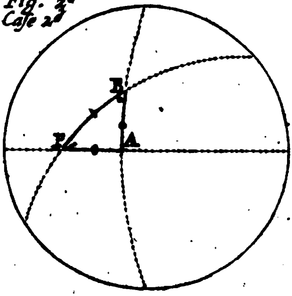
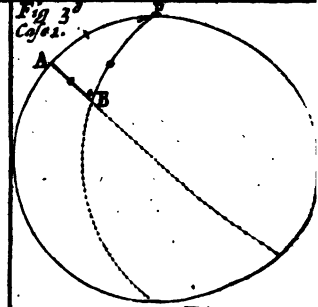


Fig 3d Case 1.



3. Through the Center, of the Primitive and point B, draw a Diameter, cutting the Primitive Circle in A; and 'tis done.

Caſe. II.

Where the point P *is given at pleaſure.*

1. Through P, and and the Center of the primitive Circle, draw a Diameter (or Right Circle).

Plate XIII.
Fig. II.
Caſe II.

2. By Prob. 2d of *Stereog. Prob.* ſtrike a great Circle paſſing thro' the point P, and making an Angle with the Diameter drawn through P, of 50 *deg.*

3. By the help of the Pole of this Circle, meaſure P B = 60.

4. Through the Poles of the Diameter paſſing thro' P and the Point B, ſtrike a great Circle cutting the Diameter in A, and 'tis done.

The parts required, may be meaſured by the help of the 7th and 8th Prob. of *Stereog. Prob.*

PROB. III.

A Leg with its adjacent Angle given to find the reſt.

EXAMPLE.

Given P A . 50 *d* } Reqd. { P B,
P . 36 } { B A,
{ Angle B.

Plate XIII.
Fig. III.
Caſe I.

I ſhall Inſtance only in two Caſes.

1. Where the Leg P A, is projected in the Primitive Circle do thus;

1. From P, lay off PA = 50 *deg.* in the Primitive Circle.
2. Through P, draw a great Circle, making an Angle of 36 *deg.*
3. Through A, draw a Diameter (or Right Circle,) and 'tis done.

2. Where the Leg AP is projected in the Diameter, the Point P being in the Center.

Plate XIV. *Fig.* I. 1. Draw a Diameter, and from the Center, lay off the Tangent of 25 *deg.* (or Semitangent of 50) from the Center P to A.

2. Draw another Diameter, making with the given Diameter an Angle of 30 *deg.*

3. Through the Poles of the given Diameter, (in which PA is Projected) and point A, ſtrike a great Circle, cutting the 2d Diameter in B, then is PBA the Triangle required; whoſe parts may be meaſured by Prob. 7 and 8, of *Stereog. Prob.*

PROB. IV.

The Hypothenuſe, and one Leg given, to find the Reſt.

EXAMPLE.

Plate XIV.
Fig. II.
Caſe I.

Given BP. 46 *d.* } Reqd. { BA,
PA. 37 } { B and P.

I ſhall take Notice only of two Caſes.

1. Where B is in the Periphery of the Primitive Circle.
2. Where 'tis in the Center.

Caſe I.

1. Deſcribe a Parallel to a Right Circle, whoſe Pole B, is diſtant from B, 46 *deg.*

2. Deſcribe a Parallel to the Primitive Circle, diſtant from the Center, by the Complement of P A, *viz.* 53 *deg.* which may cut the former Parallel in P.

3. Through the Center of the Primitive Circle, and the Point P, draw a Diameter cutting the Primitive Circle in A.

4. Laſtly, through B and P, deſcribe a great Circle, and 'tis done.

Caſe II.

Plate XIV *Fig.* II. *Caſe* II.

1. Draw a Diameter.

2. On the Center B, with the Semi-tangent of 46 *deg.* deſcribe a Circle Parallel to the Primitive Circle.

3. Deſcribe a Parallel to the 1ſt Diameter, diſtant from its Pole by the diſtance of the Complement of P A, which will interſect the Parallel to the Primitive Circle P.

4. Through the Center of the Primitive Circle, and point P, draw a Diameter.

5. Through the Pole of the 1ſt Diameter, and Point P, draw a great Circle, and you ſhall have the Triangle B P A.

Whoſe unknown parts may be meaſured by Prob. 7, 8, of *Stereog. Prob.*

PROB. V.

A Leg with its opposite Angle given, to find the rest.

EXAMPLE.

Plate XIV. Given Angle B = 24 *d.* 40′ } Req. { A B,
Fig. III. P A = 16. 17 } { B P, An. P

1. Draw an Oblique Circle, making an Angle with the Primitive, at the Point B, of 24 *d.* 40′ by Prob. 2. of *Stereog. Prob.*

2. With the Semi-tangent of 73 *d.* 40′, the Complement of P A, one Foot being in the Center, draw a Circle Parallel to the Primitive, cutting the Oblique Circle in P.

3. Through the Center of the Primitive Circle and Point P, draw a Diameter (or Right Circle) cutting the Primitive Circle in A, and 'tis done.

The parts required, are measured by the 7th and 8th Prob. of *Stereog. Prob.*

PROB. VI.

Both Oblique Angles given, to find the rest.

EXAMPLE.

Plate XIV. Given B = 46 *deg.* } Reqd. { B P,
Fig. IV. P = 59 } { B A, P A.

1. By Prob. 2. make the Angle B P A = 59 *deg.* by drawing the Oblique Circle P A.
2. Find the Pole *p*, of the Oblique Circle P A, by Prob. 1. Caſe 3. of *Stereog. Prob.*
3. Through *p*, the Pole, draw a great Circle, ſo that that it may make with the Primitive, an Angle of 46 *deg.* which will cut the Oblique Circle P A in A, and 'tis done.

The three things required, *viz.* A B, B P, P A, are meaſured by the 7th Prob. of *Stereog. Prob.*

THE PROJECTION OF Oblique Spherical Triangles.

PROB. VII.

Two Sides, and an Angle oppoſite to one of them given, to Project the Triangle, and find the reſt.

EXAMPLE.

Plate XIV. *Fig.* V.

Given BP = 34 *d.* 50′ } Reqd. { P,
DP = 25 30 } Reqd. { D,
B = 30 7 } Reqd. { BD.

Note, that this Caſe is Ambiguous, there being two Anſwers; but by the Projection, you may give both.

1. Make the Angle PBD = 30 *d.* 7′, by Prob. 2. Caſe 2. by drawing the Oblique Circle BD.
2. On the Primitive Circle, lay off BP, 34 *deg.* 50′.
3. Draw a Parallel Circle diſtant from P, 25 *deg.* cutting the Oblique Circle in two points, D. D.
4. Through P, and each of the Points D. D. draw great Circles, and you have two Triangles BPD, BPD, in one of which the Angle D is accute, in the other Obtuſe, &c.

The

Plate 14.

Fig. 1.st

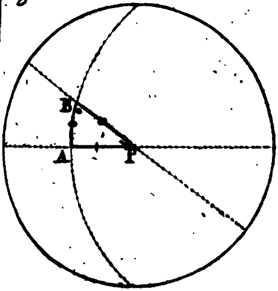


Fig. 2.d
Case 1.st

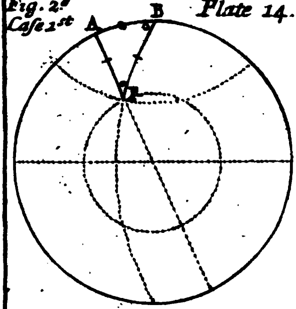


Fig. 2.d
Case 2.d

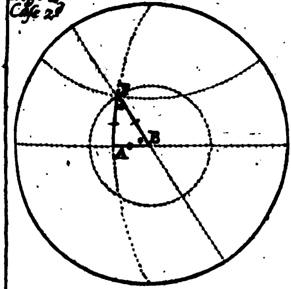


Fig. 3.d

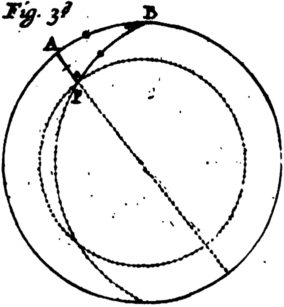


Fig. 4.

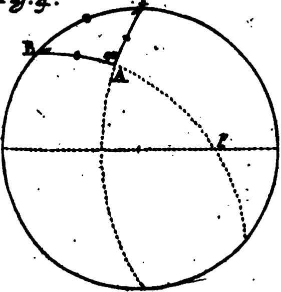
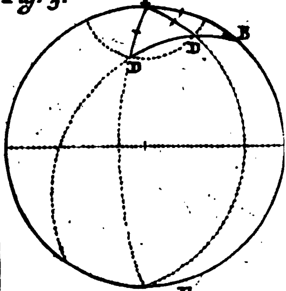


Fig. 5.



Page 132.

The parts required, may be meaſured by Prob 7 or 8, of *Stereog. Prob.*

PROB. VIII.

Two Angles, and a Side oppoſite to one of them given, to project the Triangle, and find the Reſt.

EXAMPLE.

Given BP = 60 *d.* 10′ } Reqd. { BD,
B = 40 00 } { PD,
D = 50 00 } { P.

Plate XV. *Fig.* I.

1. By Prob 2, of *Stereog. Prob.* make the Angle PBD = to 40 *deg.* by drawing the Oblique Circle BP.
2. Draw a Parallel to a Right Circle, diſtant from B, 60 *deg.* cutting the Oblique Circle in P, by Prob. 9. of *Stereog. Prob.*
3. Through P, draw a great Cricle, ſo as to make an Angle of 50 *deg.* as DP; and 'tis done.]

The things required, are meaſured by Prob. 7 and 8, of *Stereog. Prob.*

PROB. IX.

Two Legs with an Angle included, to project the Triangle and find the reſt.

EXAMPLE.

Given BP = 60 *d* } Reqd. { PD,
B = 40 } { P,
BD = 87 30′ } { D.

Plate XV. *Fig.* II.

1. Draw an Oblique Circle BD, making an Angle with the Primitive Circle = 40 *deg.* by Prob. 2. of *Stereog. Prob.*

2. Make BP = 60 *deg.* and by help of the Pole of the Oblique Circle BD, make BD = 87 *deg.*

3. Through P and D, draw a great Circle, and 'tis done.

The parts required, are meaſured by Prob. 7 and 8, of *Stereog. Prob.*

PROB. X.

Two Angles and a Side included given, to project the Triangle and find the reſt.

EXAMPLE.

Plate XV. *Fig.* III.

Given B 40 *d.*
P 118 06′
BP 60 10
Reqd. PD, BD, D.

1. Make BP = 60 *deg.* 10′, by Prob. 6, Caſe 1. of *Stereog. Prob.*

2. Make the Angle BPD = 118 *deg.* 06′, by drawing the Oblique Circle PD, and at the point B, make the Angle PBD = 40 *deg.* (by Prob. 2.) which 2 Oblique Circles will interſect in D, and 'tis done.

The parts required, are meaſured by Prob. 7 and 8. of *Stereog. Prob.*

PROB. XI.

Three ſides being given, to project the Triangle, and find the Angles.

EXAMPLE.

Plate XV. *Fig.* IV.

Given BP = 60 *d.* 10
DP = 46 12
BD = 87 30
Reqd. the Angles B, P, D.

On

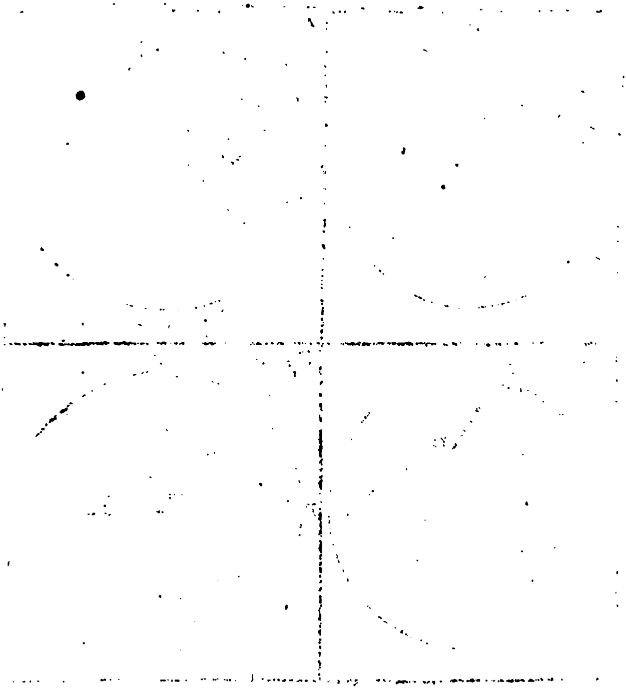


Fig. 1.

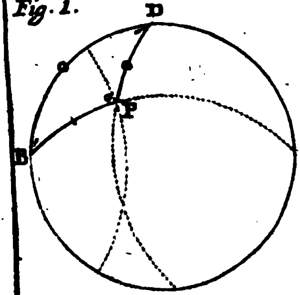


Fig. 2.

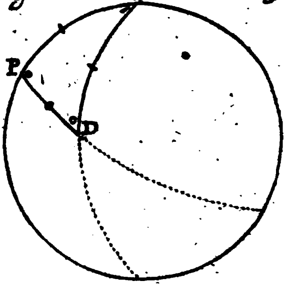


Fig. 3.

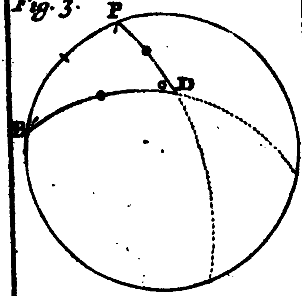
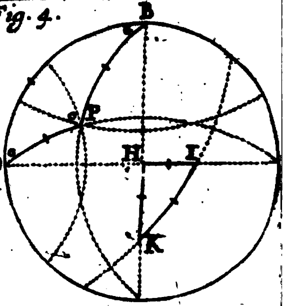


Fig. 4.



1. On the Primitive Circle, make B D = 87 *d.* 30′ the greater given ſide, by help of a line of Chords.
2. Draw a Parallel Circle at 60 *d.* 10′ diſtance from B, and likewiſe in another at 46 *d.* 12′ diſtance from D, cutting each other in the point P.
3. Through B and P; and likewiſe through D and P, draw a great Circle and 'tis done.

Note, that in the Triangle H I K, made by the Circles, paſſing thro' the Poles of the ſides B D, B P, and D P; H I is the meaſure of the Angle B, H K the meaſure of the Angle D, K I the Supplement of the meaſure of the Angle P, which may be meaſured by Prob. 7, of *Stereog. Prob.*

P R O B. XII.

Three Angles being given, to make a Triangle, and conſequently to meaſure the Sides,

R U L E.

Plate XV. *Fig.* IV.

With the three Angles given, as if they were ſides, project the Triangle B D P.

Then meaſure the ſides of the Triangle H I K, made by three Arcs paſſing through the Poles of the ſides D B. B P and D P, and you have the Angles of the Triangle required; ſave that the greateſt ſide is the Supplement of the greateſt Angle in the Triangle B D P, and conſequently of the greateſt ſide in the Triangle required.

F I N I S.

A

TABLE

OF

Logarithms,

For Numbers Increaſing in their Natural Order, from an Unit to 10000.

With a TABLE of Artificial SINES, TANGENTS and SECANTS, the Radius 10,000000.

Carefully Corrected by SAM. HEYNES,
Late Reader of Mathematicks *to His Majeſty's Engineers.*

London, Printed by *W. Redmayne* for *Jer. Seller* and *Cha. Price*, at the *Hermitage-ſtairs*; where you may be furniſhed with all ſorts of Mathematical Books and Inſtruments. 1701.

A TABLE of Logarithms,

from 1 to 10000.

Num	Logar.	Num	Logar.	Num	Logar.
1	0.000000	34	1.531479	67	1.826075
2	0.301030	35	1.544068	68	1.832509
3	0.477121	36	1.556302	69	1.838849
4	0.602060	37	1.568202	70	1.845098
5	0.698970	38	1.579784	71	1.851258
6	0.778151	39	1.591065	72	1.857332
7	0.845098	40	1.602060	73	1.863323
8	0.903090	41	1.612784	74	1.869232
9	0.954242	42	1.623249	75	1.875061
10	1.000000	43	1.633468	76	1.880814
11	1.041393	44	1.643453	77	1.886491
12	1.079181	45	1.653212	78	1.892095
13	1.113943	46	1.652758	79	1.897627
14	1.146128	47	1.672098	80	1.903090
15	1.176091	48	1.681241	81	1.908485
16	1.204120	49	1.690196	82	1.913814
17	1.230449	50	1.698970	83	1.919078
18	1.255272	51	1.707570	84	1.924279
19	1.278754	52	1.716003	85	1.929419
20	1.301030	53	1.724276	86	1.934498
21	1.322219	54	1.732394	87	1.939519
22	1.342423	55	1.740363	88	1.944483
23	1.361728	56	1.748188	89	1.949390
24	1.380211	57	1.755875	90	1.954242
25	1.397940	58	1.763428	91	1.959041
26	1.414973	59	1.770852	92	1.963788
27	1.431364	60	1.778151	93	1.968483
28	1.447158	61	1.785330	94	1.973128
29	1.462398	62	1.792392	95	1.977724
30	1.477121	63	1.799340	96	1.982271
31	1.491362	64	1.806180	97	1.986772
32	1.505150	65	1.812913	98	1.991226
33	1.518514	66	1.819544	99	1.995635

A Table of Logarithms,

Num	0	1	2	3	4	Diff.
100	2.000000	2.000434	2.000868	2.001301	2.001734	432
101	2.004321	2.004751	2.005180	2.005609	2.006038	428
102	2.008600	2.009026	2.009451	2.009876	2.010300	424
103	2.012837	2.013259	2.013680	2.014100	2.014520	419
104	2.017033	2.017451	2.017868	2.018284	2.018700	416
105	2.021189	2.021603	2.022016	2.022428	2.022841	412
106	2.025306	2.025715	2.026124	2.026533	2.026942	408
107	2.029384	2.029789	2.030195	2.030600	2.031004	404
108	2.033424	2.033826	2.034227	2.034628	2.035029	400
109	2.037426	2.037825	2.038223	2.038620	2.039017	396
110	2.041393	2.041787	2.042182	2.042575	2.042969	393
111	2.045323	2.045714	2.046105	2.046495	2.046885	389
112	2.049218	2.049606	2.049993	2.050380	2.050766	386
113	2.053078	2.053463	2.053846	2.054230	2.054613	382
114	2.056905	2.057286	2.057666	2.058046	2.058426	379
115	2.060698	2.061075	2.061452	2.061829	2.062206	376
116	2.064458	2.064832	2.065206	2.065580	2.065953	372
117	2.068186	2.068557	2.068928	2.069298	2.069668	369
118	2.071882	2.072250	2.072617	2.072985	2.073352	366
119	2.075547	2.075912	2.076276	2.076640	2.077004	363
120	2.079181	2.079543	2.079904	2.080266	2.080626	360
121	2.082785	2.083144	2.083503	2.083861	2.084219	357
122	2.086360	2.086716	2.087071	2.087426	2.087781	355
123	2.089905	2.090258	2.090611	2.090963	2.091315	351
124	2.093422	2.093772	2.094122	2.094471	2.094820	349
125	2.096910	2.097257	2.097604	2.097951	2.098297	346
126	2.100371	2.100715	2.101059	2.101403	2.101747	343
127	2.103804	2.104145	2.104487	2.104828	2.105169	340
128	2.107210	2.107549	2.107888	2.108227	2.108565	338
129	2.110590	2.110926	2.111262	2.111598	2.111934	335
130	2.113943	2.114277	2.114611	2.114944	2.115278	333
131	2.117271	2.117603	2.117934	2.118265	2.118595	330
132	2.120574	2.120903	2.121231	2.121560	2.121888	32
133	2.123852	2.124178	2.124504	2.124830	2.125156	32
134	2.127105	2.127429	2.127752	2.128076	2.128399	32
135	2.130334	2.130655	2.130977	2.131298	2.131619	32
136	2.133539	2.133858	2.134177	2.134496	2.134814	31
137	2.136721	2.137037	2.137354	2.137670	2.137987	31

Num	5	6	7	8	9	Diff.
100	2.002166	2.002598	2.003029	2.003460	2.003891	432
101	2.006466	2.006894	2.007321	2.007748	2.008174	428
102	2.010724	2.011147	2.011570	2.011993	2.012415	424
103	2.014940	2.015360	2.015779	2.016197	2.016615	419
104	2.019116	2.019532	2.019947	2.020361	2.020775	416
105	2.023252	2.023664	2.024075	2.024486	2.024896	412
106	2.027350	2.027757	2.028164	2.028571	2.028978	408
107	2.031408	2.031812	2.032216	2.032619	2.033021	404
108	2.035430	2.035830	2.036229	2.036629	2.037028	400
109	2.039414	2.039811	2.040207	2.040602	2.040998	396
110	2.043362	2.043755	2.044148	2.044540	2.044931	393
111	2.047275	2.047664	2.048053	2.048442	2.048830	389
112	2.051152	2.051538	2.051924	2.052309	2.052694	386
113	2.054996	2.055378	2.055760	2.056142	2.056524	382
114	2.058805	2.059185	2.059563	2.059942	2.060320	379
115	2.062582	2.062958	2.063333	2.063709	2.064083	376
116	2.066326	2.066698	2.067071	2.067443	2.067814	372
117	2.070038	2.070407	2.070776	2.071145	2.071514	369
118	2.073718	2.074085	2.074451	2.074816	2.075182	366
119	2.077368	2.077731	2.078094	2.078457	2.078819	363
120	2.080987	2.081347	2.081707	2,082067	2.082426	360
121	2.084576	2.084934	2.085291	2.085647	2.086001	357
122	2.088136	2.088490	2.088845	2.089198	2.089552	355
123	2.091667	2.092018	2.092370	2.092721	2.093071	351
124	2.095169	2.095518	2.095866	2.096215	2.096562	349
125	2.098644	2.098990	2.099335	2.099681	2.100026	346
126	2.102090	2.102434	2.102777	2.103119	2.103462	343
127	2.105510	2.105851	2.106191	2.106531	2.106870	340
128	2.108903	2.109241	2.109578	2.109916	2.110253	338
129	2.112270	2.112605	2.112940	2.113275	2.113609	335
130	2.115610	2.115943	2.116276	2.116608	2.116940	333
131	2.118926	2.119256	2.119586	2.119915	2.120245	330
132	2.122216	2.122543	2.122871	2.123198	2.123525	328
133	2.125481	2.125806	2.126131	2.126456	2.126781	325
134	2.128722	2.129045	2.129368	2.129690	2.130012	323
135	2.131939	2.132260	2.132580	2.132900	2.133219	321
136	2.135133	2.135451	2.135768	2.136086	2.136403	318
137	2.138303	2.138618	2.138934	2.139249	2.139564	315

Num	0	1	2	3	4	Diff.
138	2.139879	2.140194	2.140508	2.140822	2.141136	314
139	.143015	.143327	.143639	.143951	.144263	311
140	.146128	.146438	.146748	.147058	.147367	309
141	.149219	.149527	.149835	.150142	.150449	307
142	.152288	.152594	.152900	.153205	.153510	305
143	.155336	.155640	.155943	.156246	.156549	303
144	2.158362	2.158664	2.158965	2.159266	2.159567	301
145	.161368	.161667	.161967	.162266	.162564	299
146	.164353	.164650	.164947	.165244	.165541	297
147	.167317	.167613	.167908	.168203	.168497	295
148	.170262	.170555	.170848	.171141	.171434	293
149	.173186	.173478	.173769	.174060	.174351	291
150	2.176001	2.176381	2.176670	2.176959	2.177248	289
151	.178977	.179264	.179552	.179839	.180126	287
152	.181844	.182129	.182415	.182700	.182985	285
153	.184691	.184975	.185259	.185542	.185826	283
154	.187521	.187803	.188084	.188366	.188647	281
155	.190332	.190612	.190892	.191171	.191451	279
156	2.193125	2.193403	2.193681	2.193959	2.194237	278
157	.195900	.196176	.196452	.196729	.197005	276
158	.198657	.198932	.199206	.199481	.199755	274
159	.201397	.201670	.201943	.202216	.202488	272
160	.204120	.204391	.204662	.204933	.205204	271
161	.206826	.207095	.207365	.207634	.207903	269
162	2.209515	2.209783	2.210051	2.210318	2.210586	267
163	.212188	.212454	.212720	.212986	.213252	266
164	.214844	.215109	.215373	.215638	.215902	264
165	.217484	.217747	.218010	.218273	.218535	262
166	.220108	.220370	.220631	.220892	.221153	261
167	.222716	.222976	.223236	.223496	.223755	259
168	.225309	.225568	.225826	.226084	.226342	258
169	2.227887	2.228143	2.228400	2.228657	2.228913	256
170	.230449	.230704	.230960	.231215	.231470	254
171	.232996	.233250	.233504	.233757	.234011	253
172	.235528	.235781	.236033	.236285	.336537	252
173	.238046	.238297	.238548	.338799	.239049	250
174	.240549	.240799	.241048	.241297	.241546	249
175	.243038	.243286	.243534	.243782	.244030	248

Num	5	6	7	8	9	Diff.
138	2.141450	2.141763	2.142076	2.142389	2.142702	314
139	.144574	.144885	.145196	.145507	.145818	311
140	.147676	.147985	.148294	.148603	.148911	309
141	.150756	.151063	.151370	.151676	.151982	307
142	.153815	.154119	.154424	.154728	.155032	305
143	.156852	.157154	.157457	.157759	.158061	303
144	2.159868	2.160168	2.160468	2.160769	2.161068	301
145	.162863	.163161	.163459	.163757	.164055	299
146	.165838	.166134	.166430	.166726	.167022	297
147	.168792	.169086	.169380	.169674	.169968	295
148	.171725	.172019	.172311	.172603	.172895	293
149	.174641	.174932	.175222	.175512	.175802	291
150	2.177536	2.177825	2.178113	2.178401	2.178689	289
151	.180413	.180699	.180986	.181272	.181558	287
152	.183270	.183554	.183839	.184123	.184407	285
153	.186108	.186391	.186674	.186956	.187239	283
154	.188928	.189209	.189490	.189771	.190051	281
155	.191730	.192010	.192289	.192567	.192846	279
156	2.194514	2.194792	2.195069	2.195346	2.195623	278
157	.197280	.197556	.197832	.198107	.198382	276
158	.200029	.200303	.200577	.200850	.201124	274
159	.202761	.203033	.203305	.203577	.203848	272
160	.205475	.205745	.206016	.206286	.206556	271
161	.208172	.208441	.208710	.208978	.209247	269
162	2.210853	2.211120	2.211388	2.211654	2.211921	267
163	.213518	.213783	.214049	.214314	.214579	266
164	.216166	.216430	.216694	.216957	.217221	264
165	.218798	.219060	.219322	.219584	.219846	262
166	.221414	.221675	.221936	.222196	.222456	261
167	.224015	.224274	.224533	.224792	.225051	259
168	.226600	.226858	.227115	.227372	.227630	258
169	2.229170	2.229426	2.229682	2.229938	2.230193	256
170	.231724	.231979	.232233	.232488	.232742	254
171	.234264	.234517	.234770	.235023	.235276	253
172	.236789	.237041	.237292	.237544	.237795	252
173	.239299	.239549	.239800	.240050	.240299	250
174	.241795	.242044	.242293	.242541	.242790	249
175	.244277	.244524	.244772	.245010	.245266	248

A Table of Logarithms.

Num	0	1	2	3	4	Dif
214	2.330414	2.330617	2.330819	2.331022	2.331225	20
215	.332438	.332640	.332842	.333044	.333246	20
216	.334454	.334655	.334856	.335056	.335257	20
217	.336460	.336660	.336860	.337060	.337260	20
218	.338456	.338656	.338855	.339054	.339253	19
219	.340444	.340642	.340840	.341039	.341237	19
220	2.342423	2.342620	2.342817	2.343014	2.343212	19
221	.344392	.344589	.344785	.344981	.345178	19
222	.346353	.346549	.346744	.346939	.347135	19
223	.348305	.348500	.348694	.348889	.349083	19
224	.350248	.350442	.350636	.350829	.351023	19
225	.352182	.352375	.352568	.352761	.352954	19
226	2.354108	2.354301	2.354493	2.354684	2.354876	19
227	.356026	.356217	.356408	.356599	.356790	19
228	.357935	.358125	.358316	.358506	.358696	19
229	.359835	.360025	.360215	.360404	360593	18
230	.361728	.361917	.362105	.362294	.362482	18
231	.363612	.363800	.363988	.364176	.364363	18
232	2.365488	2.365675	2.365862	2.366049	2.366236	18
233	.367356	.367542	.367728	.367915	.368101	18
234	.369216	.369401	.369587	.369772	.369958	18
235	.371068	.371253	.371437	.371622	.371806	18
236	.372912	.373096	.373280	.373464	.373647	18
237	.374748	.374931	.375115	.375298	.375481	18
238	2.376577	2.376759	2.376942	2.377124	2.377306	18
239	.378398	.378580	.378761	.378943	.379124	18
240	.380211	.380392	.380573	.380754	.380934	18
241	.382017	.382197	.382377	.382557	.382737	18
242	.383815	.383995	.384174	.384353	.384533	17
243	.385606	.385785	.385964	.386142	.386321	17
244	.387390	.387568	.387746	.387923	.388101	17
245	2.389166	2.389343	2.389520	2.389967	2.389874	17
246	.390935	.391112	.391288	.391464	.391641	17
247	.392697	.392873	.393048	.393224	.393400	17
248	.394452	.394627	.394802	.394977	.395152	17
249	.396199	.396374	.396548	.396722	.396896	17
250	.397940	.398114	.398287	.398461	.398634	17
251	.399674	.399847	.400020	.400192	.400365	17

Num	5	6	7	8	9	Diff.
214	2.331427	2.331629	2.331832	2.332034	2.332230	202
215	.333447	.333649	.333850	.334051	.334253	202
216	.335458	.335658	.335859	.336059	.336259	201
217	.337459	.337659	.337858	.338058	.338257	200
218	.339451	.339650	.339849	.340047	.340246	199
219	.341434	.341632	.341830	.342028	.342225	198
220	2.343409	2.343605	2.343802	2.343999	2.344196	197
221	.345374	.345570	.345766	.345961	.346157	196
222	.347330	.347525	.347720	.347915	.348110	195
223	.349277	.349472	.349660	.349860	.350054	194
224	.351216	.351500	.351603	.351796	.351989	193
225	.353146	.353339	.353532	.353724	.353916	193
226	2.355068	2.355260	2.355451	2.355643	2.355834	192
227	.356981	.357172	.357363	.357554	.357744	191
228	.358886	.359076	.359266	.359456	.359646	190
229	.360783	.360972	.361161	.361350	.361539	189
230	.362671	.362859	.363048	.363236	.363424	188
231	.364551	.364739	.364926	.365113	.365301	188
232	2.366423	2.366700	2.366796	2.366983	2.367169	187
233	.368287	.368473	.368659	.368844	.369030	186
234	.370143	.370328	.370513	.370698	.370883	185
235	.371991	.372175	.372360	.372544	.372728	184
236	.373831	.374015	.374198	.374382	.374565	184
237	.375664	.375846	.376029	.376212	.376394	183
238	2.377488	2.377670	2.377852	2.378034	2.378216	182
239	.379305	.379487	.379668	.379849	.380030	181
240	.381115	.381296	.381476	.381656	.381837	181
241	.382917	.383097	.383277	.383456	.383636	180
242	.384712	.384891	.385070	.385249	.385427	179
243	.386499	.386677	.386855	.387034	.387212	178
244	.388279	.388456	.388634	.388811	.388989	178
245	2.390051	2.390228	2.390405	2.390582	2.390758	177
246	.391817	.391993	.392169	.392345	.392521	176
247	.393575	.393751	.393926	.394101	.394276	176
248	.395326	.395501	.395676	.395850	.396025	175
249	.397070	.397245	.397418	.397592	.397766	174
250	.398808	.398981	.399154	.399327	.399501	173

A Table of Logarithms,

Num	0	1	2	3	4	Diff.
252	2.401400	2.401573	2.401745	2.401917	2.402089	172
253	.403120	.403292	.403464	.403635	.403807	171
254	.404834	.405005	.405175	.405346	.405517	171
255	.406540	.406710	.406881	.407051	.407221	170
256	.408240	.408400	.408579	.408749	.408918	169
257	.409933	.410102	.410271	.410440	.410608	169
258	2.411620	2.411788	2.411956	2.412124	2.412292	168
259	.413300	.413467	.413635	.413802	.413970	167
260	.414973	.415140	.415307	.415474	415641	167
261	.416640	.416807	.416973	.417139	.417306	166
262	.418301	.418467	.418633	.418798	.418964	165
263	.419956	.420121	.420286	.420451	.420616	165
264	2.421604	2.421768	2.421933	2.422097	2.422261	164
265	.423246	.423410	.423573	.423737	.423901	164
266	.424882	.425045	.425208	.425371	.425534	163
267	.426511	.426674	.426836	.426999	.427161	162
268	.428135	.428297	.428459	.428621	.428782	162
269	.429752	.429914	.430075	.430236	.430398	161
270	2.431364	2.431525	2.431685	2.431846	2.432007	161
271	.432969	.433129	.433290	.433450	.433610	160
272	.434569	.434728	.434888	.435048	.435207	159
273	.436163	.436322	.436481	.436640	.436798	159
274	.437751	.437909	.438067	.438226	.438384	158
275	.439333	.439491	.439648	.439806	.439964	158
276	2.440909	2.441066	2.441224	2.441381	2.441538	157
277	.442480	.442636	.442793	.442950	.443106	157
278	.444045	.444201	.444357	.444513	.444669	156
279	.445604	.445760	.445915	.446071	.446226	155
280	.447158	.447313	.447468	.447623	.447778	155
281	.448706	.448861	.449015	.449170	.449324	154
282	.450259	.450403	.450557	.450711	.450865	154
283	2.451786	2.451940	2.452093	2 452247	2.452400	153
284	.453318	.453471	.453624	.453777	.453930	153
285	.454845	.454997	.455149	.455302	.455454	152
286	.456366	.456518	.456670	.456821	.456973	152
287	.457882	.458033	.458184	.458336	.458487	151
288	.459392	.459543	.459694	.459845	.459995	151
289	.460898	.461048	.461198	.461348	.461408	150

Num	5	6	7	8	9	Diff.
252	2.402261	2.402433	2.402605	2.402777	2.402949	172
253	.403978	.404149	.404320	.404492	.404663	171
254	.405688	.405858	.406029	.406199	.406370	171
255	.407391	.407561	.407731	.407900	.408070	170
256	.409087	.409257	.409426	.409595	.409764	169
257	.410777	.410946	.411114	.411283	.411451	169
258	2.412460	2.412628	2.412796	2.412964	2.413132	168
259	.414137	.414305	.414472	.414639	.414806	167
260	.415808	.415974	.416141	.416308	.416474	167
261	.417472	.417638	.417804	.417970	.418135	166
262	.419129	.419295	.419460	.419625	.419791	165
263	.420781	420945	.421110	.421275	.421439	165
264	2.422426	2.422590	2.422754	2.422918	2.423082	164
265	.424064	.424228	.424391	.424555	.424718	164
266	.425697	.425860	.426023	.426186	.426349	163
267	.427324	.427486	.427648	.427811	.427973	162
268	.428944	.429106	.429268	.429429	.429591	162
269	.430559	.430720	.430881	.431042	.431203	161
270	2.432167	2.432328	2.432488	2.432649	2.432809	160
271	.433770	.433930	.434090	.434249	.434409	160
272	.435366	.435526	.435685	.435844	.436003	159
273	.436957	.437116	.437275	.437433	.437592	159
274	.438542	.438700	.438859	.439017	.439175	158
275	.440122	.440279	.440437	.440594	.440752	158
276	2.441695	2.441852	2.442009	2.442166	2.442323	157
277	.443263	.443419	.443576	.443732	.443888	157
278	.444825	.444981	.445137	.445293	.445448	156
279	.446382	.446537	.446692	.446848	.447003	155
280	.447933	.448088	.448242	.448397	.448552	155
281	.449478	.449633	.449787	.449941	.450095	154
282	.451018	.451172	451326	.451479	.451633	154
283	2.452553	2.452706	2.452859	2.453012	2.453165	153
284	.454082	.454235	.454387	.454540	.454692	153
285	.455606	.455758	.455910	.456062	.456214	152
286	.457125	.457276	.457428	.457579	.457730	152
287	.458638	.458789	.458940	.459091	.459242	151
288	.460146	.460296	.460447	.460597	.460747	151
289	.461649	.461799	.461948	.462098	.462248	150

Num	0	1	2	3	4	Diff.
290	2.462398	2.462548	2.462697	2.462847	2.462997	150
291	.463893	.464042	.464191	.464340	.464489	149
292	.465383	.465532	.465680	.465829	.465977	149
293	.466868	.467016	.467164	.467312	.467460	148
294	.468347	.468495	.468643	.468790	.468938	147
295	.469822	.469969	.470116	.470263	.470410	147
296	2.471292	2.471438	2.471585	2.471732	2.471878	146
297	.472756	.472903	.473049	.473195	.473341	146
298	.474216	.474362	.474508	.474653	.474799	146
299	.475671	.475816	.475962	.476107	.476252	145
300	.477121	.477266	.477411	.477555	.477700	145
301	.478566	.478711	.478855	.478999	.479143	144
302	2.480007	2.480151	2.480294	2.480438	2.480582	144
303	.481443	.481586	.481729	.481872	.482016	143
304	.482874	.483016	.483159	.483302	.483445	143
305	.484300	.484442	.484584	.484727	.484869	142
306	.485721	.485863	.486005	.486147	.486289	142
307	.487138	.487280	487421	.487563	.487704	141
308	2.488551	2.488692	2.488833	2.488973	2.489114	141
309	.489958	.490099	.490239	.490380	.490520	140
310	.491362	.491502	.491642	.491782	.491922	140
311	.492760	.492900	.493040	.493179	.493319	139
312	.494155	.494294	.494433	.494572	494711	139
313	.495544	.495683	.495822	.495960	.496099	139
314	2.496930	2.497068	2.497206	2.497344	2.497482	138
315	.498311	.498448	.498586	.498724	.498862	138
316	.499687	.499824	.499962	.500099	.500236	137
317	.501059	.501196	.501333	.501470	.501607	137
318	.502427	.502564	.502700	.502837	.502973	136
319	.503791	.503927	.504063	.504199	.504335	136
320	.505150	.505286	.505421	.505557	.505692	136
321	2.506505	2.506640	2.506775	2.506911	2.507046	135
322	.507856	.507991	.508125	.508260	.508395	135
323	.509202	.509337	.509471	.509606	.509740	134
324	.510545	.510679	.510813	.510947	.511081	134
325	.511883	.512017	.512150	.512284	.512417	133
326	.513218	.513351	.513484	.513617	.513750	13
327	.514548	.514680	.514813	.514946	.515079	13

Num	5	6	7	8	9	Diff.
290	2.463146	2.463296	2.463445	2.463594	2.463744	150
291	.464639	.464787	.464936	.465085	.465234	149
292	.466126	.466274	.466423	.466571	.466719	149
293	.467608	.467756	.467904	.468052	468200	148
294	.469085	.469233	.469380	.469527	.469675	147
295	.470557	.470704	.470851	.470998	.471145	147
296	2.472025	2.472171	2.472317	2.472464	2 472610	146
297	.473487	.473633	.473779	.473925	.474070	146
298	.474944	.475090	.475235	.475381	.475526	146
299	.476397	.476542	.476687	.476832	.476976	145
300	.477844	.477989	.478133	.478278	.478422	145
301	.479287	.479431	.479575	.479719	.479863	144
302	2.480725	2 480869	2.481012	2.481156	2.481299	144
303	.482159	.482302	.482445	.482588	.482731	143
304	.483587	.483730	.483872	.484015	.484157	143
305	.485011	.485153	.485295	.485437	.485579	142
306	.486430	.486572	.486714	.486855	.486997	142
307	.487845	.487986	.488127	.488269	.488410	141
308	2.489255	2.489396	2.489537	2.489677	2.489818	141
309	.490661	.490801	.490941	.491081	.491222	140
310	.492062	.492201	.492341	.492481	.492621	140
311	.493458	.493597	.493737	.493876	.494015	139
312	.494850	.494989	.495128	.495267	.495406	139
313	.496237	.496376	.496514	.496653	.496791	139
314	2.497621	2.497759	2.497897	2.498035	2.498173	138
315	.498999	.499137	499275	.499412	.499550	138
316	.500374	.500511	.500648	.500785	.500922	137
317	.501744	.501880	.502017	.502154	.502290	137
318	.503109	.503246	.503382	.503518	.503654	136
319	.504471	.504607	.504743	.504878	.505014	136
320	.505828	.505963	.506099	.506234	.506370	136
321	2.507181	2.507316	2.507451	2.507586	2 507721	135
322	.508530	.508664	.508799	.508933	.509068	135
323	.509874	.510008	.510143	.510277	.510411	134
324	511215	.511348	.511482	.511616	.511750	134
325	.512551	.512684	.512818	.512951	.513084	133
326	.513883	.514016	.514149	.514282	.514415	133
327	.515211	.515344	.515476	.515609	.515741	133

Num.	0	1	2	3	4	Diff
328	2.515874	2.516006	2.516139	2.516271	2.516403	132
329	.517196	.517328	.517460	.517592	.517724	132
330	.518514	.518645	.518777	.518909	.519040	131
331	.519828	.519959	.520090	.520221	.520352	131
332	.521138	.521269	.521400	.521530	.521661	131
333	.522444	.522575	.522705	.522835	.522966	130
334	2.523746	2.523876	2.524006	2.524136	2.524266	130
335	.525045	.525174	.525304	.525433	.525563	129
336	.526339	.526468	.526598	.526727	.526856	129
337	.527630	.527759	.527888	.528016	.528145	129
338	.528917	.529045	.529174	.529302	.529430	128
339	.530200	.530328	.530456	.530584	.530712	128
340	2.531479	2.531607	2.531734	2.531862	2.531989	128
341	.532754	.532882	.533009	.533136	.533263	127
342	.534026	.534153	.534280	.534407	.534534	127
343	.535294	.535421	.535547	.535674	.535800	126
344	.536558	.536685	.536811	.536937	.537063	126
345	.537819	.537945	.538071	.538197	.538322	126
346	2.539076	2.539202	2.539327	2.539452	2.539578	125
347	.540329	.540455	.540580	.540705	.540830	125
348	.541579	.541704	.541829	.541953	.542078	125
349	.542825	.542950	.543074	.543199	.543323	124
350	.544068	.544192	.544316	.544440	.544564	124
351	.545307	.545431	.545554	.545678	.545802	124
352	2.546543	2.546666	2.546789	2.546913	2.547036	123
353	.547775	.547898	.548021	.548144	.548266	123
354	.549003	.549126	.549249	.549371	.549494	123
355	.550228	.550351	.550473	.550595	.550717	122
356	.551450	.551572	.551694	.551816	.551938	122
357	.552668	.552790	.552911	.553033	.553154	121
358	.553883	.554004	.554126	.554247	.554368	121
359	2.555094	2.555215	2.555336	2.555457	2.555578	121
360	.556302	.556423	.556544	.556664	.556785	120
361	.557507	.557627	.557748	.557868	.557988	120
362	.558709	.558828	.558948	.559068	.559188	120
363	.559907	.560026	.560146	.560265	.560385	119
364	.561191	.561221	.561340	.561459	.561578	119
365	.562293	.562412	.562531	.562650	.562768	119

Num	5	6	7	8	9	Diff.
328	2.516535	2.516668	2.516800	2.516932	2.517064	132
329	.517855	.517987	.518119	.518251	.518382	132
330	.519171	.519303	.519434	.519565	.519697	131
331	.520483	.520614	.520745	.520876	.521007	131
332	.521792	.521922	.522053	.522183	.522314	131
333	.523096	.523226	.523356	.523486	.523616	130
334	2.524396	2.524526	2.524656	2.524785	2.524915	130
335	.525992	.525822	.525951	.526081	.526210	129
336	.52698[illegible]	.527114	.527243	.527372	.527501	129
337	.528274	.528402	.528531	.528660	.528788	129
338	.529559	.529687	.529815	.529943	.530072	128
339	.530840	.530968	.531095	.531223	.531351	128
340	2.532117	2.532245	2.532372	2.532500	2.532627	128
341	.533391	.533518	.533645	.533772	.533899	127
342	.534661	.534787	.534914	.535041	.535167	127
343	.535927	.536053	.536179	.536306	.536432	126
344	.537189	.537315	.537441	.537567	.537693	126
345	.538448	.538574	.538699	.538825	.538951	126
346	2.539704	2.539828	2.539954	2.540079	2.540204	125
347	.540955	.541080	.541205	.541330	.541454	125
348	.542203	.542327	.542452	.542576	.542701	125
349	.543447	.543571	.543696	.543820	.543944	124
350	.544688	.544812	.544936	.545060	.545183	124
351	.545925	.546049	.546172	.546296	.546419	124
352	2.547159	2.547282	2.547405	2.547529	2.547652	123
353	.548389	.548512	.548635	.548758	.548881	123
354	.549616	.549739	.549861	.549984	.550106	123
355	.550840	.550962	.551084	.551206	.551328	122
356	.552059	.552181	.552303	.552425	.552546	122
357	.553276	.553397	.553519	.553640	.553762	121
358	.554489	.554610	.554731	.554852	.554973	121
359	2.555699	2.555820	2.555940	2.556061	2.556182	121
360	.556905	.557026	.557146	.557266	.557387	120
361	.558108	.558228	.558348	.558469	.558589	120
362	.559308	.559428	.559548	.559667	.559787	120
363	.560504	.560624	.560743	.560863	.560982	119
364	.561697	.561817	.561936	.562055	.562174	119
365	.562887	.563006	.563125	.563244	.56[illegible]	[illegible]

A Table of Logarithms,

Num	0	1	2	3	4	Diff.
366	2.563481	2.563600	2.563718	2.563837	2.563955	119
367	.564666	.564784	.564903	.565021	.565139	118
368	.565848	.565966	.566084	.566202	.566320	118
369	.567026	.567144	.567262	.567379	.567497	118
370	.568202	.568319	.568436	.568554	.568671	117
371	.569374	.569491	.569608	.569725	.569842	117
372	2.570543	2.570660	2.570776	2.570893	2.571010	117
373	.571709	.571825	.571942	.572058	.572174	116
374	.572872	.572988	.573104	.573220	.573336	116
375	.574031	.574147	.574263	.574379	.574494	116
376	.575188	.575303	.575419	.575534	.575650	115
377	.576341	.576456	.576572	.576687	.576802	115
378	2.577492	2.577607	2.577721	2.577836	2.577951	115
379	.578639	.578754	.578868	.578983	.579097	114
380	.579784	.579898	.580012	.580126	.580240	114
381	.580925	.581039	.581153	.581267	.581381	114
382	.582063	.582177	.582291	.582404	.582518	114
383	.583199	.583312	.583425	.583539	.583652	113
384	2.584331	2.584444	2.584557	2.584670	2.584783	113
385	.585461	.585573	.585686	.585799	.585912	113
386	.586587	.586700	.586812	.586925	.587037	112
387	.587711	.587823	.587935	.588047	.588160	112
388	.588832	.588944	.589055	.589167	.589279	112
389	.589950	.590061	.590173	.590284	.590396	112
390	2.591065	2.591176	2.591287	2.591398	2.591510	111
391	.592177	.592288	.592399	.592510	.592621	111
392	.593286	.593397	.593508	.593618	.593729	111
393	.594392	.594503	.594613	.594724	.594834	110
394	.595496	.595606	.595717	.595827	.595937	110
395	.596597	.596707	.596817	.596927	.597037	110
396	.597695	.597805	.597914	.598024	.598134	110
397	2.598790	2.598900	2.599009	2.599119	2.599228	109
398	.599883	.599992	.600101	.600210	.600319	109
399	.600973	.601082	.601190	.600299	.601408	109
400	.602060	.602168	.602277	.602386	.602494	108
401	.603144	.603253	.603361	603469	.603577	108
402	.604226	.604334	.604442	.604550	.604658	108
403	.605305	.605413	.605520	.605628	.605736	108

Num	5	6	7	8	9	Diff.
366	2.564074	2.564192	2.564311	2.564429	2.564548	119
367	.565257	.565375	.565494	.565612	.565730	118
368	.566437	.566555	.566673	.566791	.566909	118
369	.567614	.567732	.567849	.567967	.568084	118
370	.568788	.568905	.569023	.569140	.569257	117
371	.569959	.570076	.570193	.570309	.570426	117
372	2.571126	2.571243	2.571359	2.571476	2.571592	117
373	.572291	.572407	.572523	.572639	.572755	116
374	.573452	.573568	.573684	.573800	.573915	116
375	.574610	.574726	.574841	.574957	.575072	116
376	.575765	.575880	.575996	.576111	.576226	115
377	.576917	.577032	.577147	.577262	.577377	115
378	2.578066	2.578181	2.578295	2.578410	2.578525	115
379	.579212	.579326	.579441	.579555	.579669	114
380	.580355	.580469	.580583	.580697	.580811	114
381	.581495	.581608	.581722	.581836	.581950	114
382	.582631	.582745	.582858	.582972	.583085	114
383	.583765	.583879	.583992	.584105	.584218	113
384	2.584896	2.585009	2.585122	2.585235	2.585348	113
385	.586024	.586137	.586250	.586362	.586475	113
386	.587149	.587262	.587374	.587486	.587599	112
387	.588272	.588384	.588496	.588608	.588720	112
388	.589391	.589503	.589614	.589726	.589838	112
389	.590507	.590619	.590730	.590842	.590953	112
390	2.591621	2.591732	2.591843	2.591955	2.592066	111
391	.592732	.592843	.592954	.593064	.593175	111
392	.593840	.593950	.594061	.594171	.594282	111
393	.594945	.595055	.595165	.595276	.595386	110
394	.596047	.596157	.596267	.596377	.596487	110
395	.597146	.597256	.597366	.597476	.597585	110
396	.598243	.598353	.598462	.598572	.598681	110
397	2.599337	2.599446	2.599556	2.599665	2.599774	109
398	.600428	.600537	.600646	.600755	.600864	109
399	.601517	.601625	.601734	.601843	.601951	109
400	.602602	.602711	.602819	.602928	.603036	108
401	.603685	.603794	.603902	.604010	.604118	108
402	.604766	.604874	.604982	.605089	.605197	108
403	.605843	.605951	.606059	.606166	.606274	108

A Table of Logarithms,

Num	0	1	2	3	4	Diff.
404	2.606381	2.606489	2.606596	2.606704	2.606811	107
405	.607455	.607562	.607669	.607777	.607884	107
406	.608526	.608633	.608740	.608847	.608954	107
407	.609594	.609701	.609808	.609914	.610021	107
408	.610660	.610767	.610873	.610979	.611086	106
409	.611723	.611829	.611936	.612042	.612148	106
410	2.612784	2.612890	2.612996	2.613102	2.613207	106
411	.613842	.613947	.614053	.614159	.614264	106
412	.614897	.615003	.615108	.615223	.615319	105
413	.615950	.616055	.616160	.616265	.616370	105
414	.617000	.617105	.617210	.617315	.617420	105
415	.618048	.618153	.618257	.618362	.618466	105
416	2.619093	2.619198	2.619302	2.619406	2.619511	104
417	.620136	.620240	.620344	.620448	.620552	104
418	.621176	.621280	.621384	.621488	.621592	104
419	.622214	.622318	.622421	.622525	.622628	104
420	.623249	.623353	.623456	.623559	.623663	103
421	.624282	.624385	.624488	.624591	.624694	103
422	2.625312	2.625415	2.625518	2.625621	2.625724	103
423	.626340	.626443	.626546	.626648	.626751	103
424	.627366	.627468	.627571	.627673	.627775	102
425	.628389	.628491	.628593	.628695	.628797	102
426	.629410	.629511	.629613	.629715	.629817	102
427	.630428	.630529	.630631	.630733	.630834	102
428	2.631444	2.631545	2.631647	2.631748	2.631849	101
429	.632457	.632558	.632660	.632761	.632862	101
430	.633468	.633569	.633670	.633771	.633872	100
431	.634477	.634578	.634679	.634779	.634880	100
432	.635484	.635584	.635685	.635785	.635886	100
433	.636488	.636588	.636688	.636789	.636889	100
434	.637490	.637590	.637690	.637790	.637890	99
435	2.638489	2.638589	2.638689	2.638789	2.638888	99
436	.639486	.639586	.639686	.639785	.639885	99
437	.640481	.640581	.640680	.640779	.640879	99
438	.641474	.641573	.641672	.641771	.641870	99
439	.642464	.642563	.642662	.642761	.642860	99
440	.643453	.643551	.643650	.643749	.643847	98
441	.644439	.644537	.644635	.644734	.644832	98

Num	5	6	7	8	9	Diff.
404	2.606918	2.607026	2.607133	2.607240	2.607348	107
405	.607991	.608098	.608205	.608312	.608419	107
406	.609060	.609167	.609274	.609381	.609488	107
407	.610128	.610234	.610341	.610447	.610554	107
408	.611192	.611298	.611405	.611511	.611617	106
409	.612254	.612360	.612466	.612572	.612678	106
410	2.613313	2.613419	2.613525	2.613630	2.613736	106
411	.614370	.614475	.614581	.614686	.614792	106
412	.615424	.615529	.615634	.615740	.615845	105
413	.616475	.616580	.616685	.616790	.616895	105
414	.617524	.617629	.617734	.617839	.617943	105
415	.618571	.618675	.618780	.618884	.618989	105
416	2.619615	2.619719	2.619823	2.619928	2.620032	104
417	.620656	.620760	.620864	.620968	.621072	104
418	.621695	.621799	.621903	.622007	.622110	104
419	.622732	.622835	.622939	.623042	.623146	104
420	.623766	.623869	.623972	.624076	.624179	103
421	.624798	.624901	.625004	.625107	.625209	103
422	2.625827	2 625929	2.626032	2.626135	2.626238	103
423	.626853	.626956	.627058	.627161	.627263	103
424	.627878	.627980	.628082	.628184	.628287	102
425	.628900	.629002	.629104	.629206	.629308	102
426	.629919	.630021	.630123	.630224	.630326	102
427	.630936	.631038	.631139	.631241	.631342	102
428	2.631951	2.632052	2.632153	2.632255	2.632356	101
429	.632963	.633064	.633165	.633266	.633367	101
430	.633973	.634074	.634175	.634276	.634376	100
431	.634981	.635081	.635182	.635283	.635383	100
432	.635986	.636086	.636187	.636287	.636388	100
433	.636989	.637089	.637189	.637289	.637390	100
434	.637990	.638090	.638190	.638289	.638389	99
435	2.638988	2.639088	2.639188	2.639287	2.639387	99
436	.639984	.640084	.640183	.640283	.640382	99
437	.640978	.641077	.641176	.641276	.641375	99
438	.641970	.642069	.642168	.642267	.642366	99
439	.642959	.643058	.643156	.643255	.643354	99
440	.643946	.644044	.644143	.644242	.644340	98

A Table of Logarithms,

Num	0	1	2	3	4	Diff.
442	2.645422	2.645520	2.645619	2.645717	2.645815	98
443	.646404	.646502	.646600	.646698	.646796	98
444	.647383	.647481	.647578	.647676	.647774	98
445	.648360	.648458	.648555	.648653	.648750	97
446	.649335	.649432	.649530	.649627	.649724	97
447	.650307	.650405	.650502	.650599	.650696	97
448	2.651278	2.651375	2.651472	2.651569	2.651666	97
449	.652246	.652343	.652440	.652536	.652633	97
450	.653212	.653309	.653405	.653502	.653598	96
451	.654176	.654273	.654369	.654465	.654562	96
452	.655138	.655234	.655331	.655427	.655523	96
453	.656098	.656194	.656290	.656386	.656481	96
454	2.657056	2.657151	2.657247	2.657343	2.657438	96
455	.658011	.658107	.658202	.658298	.658393	95
456	.658965	.659060	.659155	.659250	.659346	95
457	.659916	.660011	.660106	.660201	.660296	95
458	.660865	.660960	.661055	.661150	.661245	95
459	.661813	.661907	.662002	.662096	.662191	95
460	2.662758	2.662852	2.662947	2.663041	2.663135	94
461	.663701	.663795	.663889	.663983	.664078	94
462	.664642	.664736	.664830	.664924	.665018	94
463	.665581	.665675	.665768	.665862	.665956	94
464	.666518	.666612	.666705	.666799	.666892	94
465	.667453	.667546	.667640	.667733	.667826	93
466	2.668386	2.668479	2.668572	2.668665	2.668758	93
467	.669317	.669410	.669503	.669596	.669689	93
468	.670246	.670339	.670431	.670524	.670617	93
469	.671173	.671265	.671358	.671451	.671543	93
470	.672098	.672190	.672283	.672375	.672467	92
471	.673021	.673113	.673205	.673297	.673390	92
472	.673942	.674034	.674126	.674218	.674310	92
473	2.674861	2.674953	2.675045	2.675136	2.675228	92
474	.675778	.675870	.675961	.676053	.676145	92
475	.676694	.676785	.676876	.676968	.677059	91
476	.677607	.677698	.677789	.677881	.677972	91
477	.678518	.678609	.678700	.678791	.678882	91
478	.679428	.679519	.679610	.679700	.679791	91
479	.680335	.680426	.680517	.680607	.680698	91

Num	5	6	7	8	9	Diff.
442	2.645913	2.646011	2.646109	2.646208	2.646306	98
443	.646894	.646991	.647089	.647187	.647285	98
444	.647872	.647969	.648067	.648165	.648262	98
445	.648848	.648945	.649043	.649140	.649237	97
446	.649821	.649919	.650016	.650113	.650210	97
447	.650793	.650890	.650987	.651084	.651181	97
448	2.651762	2.651859	2.651956	2.652053	2.652150	97
449	.652730	.652826	.652923	[illegible]53019	.653116	97
450	.653695	.653791	.653888	.653984	.654080	96
451	.654658	.654754	.654850	.654946	.655042	96
452	.655619	.655714	.655810	.655906	.656002	96
453	.656577	.656673	.656769	.656864	.656960	96
454	2.657534	2.657629	2.657725	2.657820	2.657916	96
455	.658488	.658584	.658679	.658774	.658070	95
456	.659441	.659536	.659631	.659726	.659821	95
457	.660391	.660486	.660581	.660676	.660771	95
458	.661339	.661434	.661529	.661623	.661718	95
459	.662285	.662380	.662474	.662569	.662663	95
460	2.663230	2.663324	2.663418	2.663512	2.663607	94
461	.664172	.664266	.664360	.664454	.664548	94
462	.665112	.665206	.665299	.665393	.665487	94
463	.666050	.666143	.666237	.666331	.666424	94
464	.666986	.667079	.667173	.667266	.667359	94
465	.667920	.668013	.668106	.668199	.668293	93
466	2.668852	2.668945	2.669038	2.669131	2.669224	93
467	.669782	.669874	.669967	.670060	.670153	93
468	.670710	.670802	.670895	.670988	.671080	93
469	.671636	.671728	.671821	.671913	.672005	93
470	.672560	.672652	.672744	.672836	.672929	92
471	.673482	.673574	.673666	.673758	.673850	92
472	.674402	.674494	.674586	.674677	.674769	92
473	2.675320	2.675412	2.675503	2.675595	2.675687	92
474	.676236	.676328	.676419	.676511	.676602	92
475	.677150	.677242	.677333	.677424	.677516	91
476	.678063	.678154	.678245	.678336	.678427	91
477	.678973	.679064	.679155	.679246	.679337	91
478	.679882	.679973	.680063	.680154	.680245	91
479	.680789	.680879	.680970	.681060	.681151	91

A Table of Logarithms,

Num	0	1	2	3	4	Diff
480	2.681241	2.681332	2.681422	2.681513	2.681603	90
481	.682145	.682235	.682326	.682416	.682506	90
482	.683047	.683137	.683227	.683317	.683407	90
483	.683947	.684037	.684127	.684217	.684307	90
484	.684845	.684935	.685025	.685114	.685204	90
485	.685742	.685831	.685921	.686010	.686100	89
486	2.686636	2.686726	2.686815	2.686904	2.686994	89
487	.687529	.687618	.687707	.687796	.687885	89
488	.688420	.688509	.688598	.688687	688776	89
489	.689309	.689398	.689486	.689575	.689664	89
490	.690196	.690285	.690373	.690462	.690550	89
491	.691081	.691170	.691258	.691347	.691435	88
492	2.691965	2.692053	2.692142	2.692230	2.692318	88
493	.692847	.692935	.693023	.693111	.693199	88
494	.693727	.693815	.693903	.693991	.694078	88
495	.694605	.694693	.694781	.694868	.694956	88
496	.695482	.695569	.695657	.695744	.695832	87
497	.696356	.696444	.696531	.696618	.696706	87
498	2.697229	2.697316	2.697404	2.697491	2.697578	87
499	.698100	.698188	.698275	.698362	.698448	87
500	.698970	.699057	.699144	.699230	.699317	87
501	.699838	.699924	.700011	.700098	.700184	87
502	.700704	.700790	.700877	.700963	.701050	86
503	.701568	.701654	.701741	.701827	.701913	86
504	2.702430	2.702517	2.702603	2.702689	2.702775	86
505	.703291	.703377	.703463	.703549	.703635	86
506	.704150	.704236	.704322	.704408	.704494	86
507	.705008	.705094	.705179	.705265	.705350	86
508	.705864	.705949	.706035	.706120	.706205	85
509	.706718	.706803	.706888	.706974	.707059	8
510	.707570	.707655	.707740	.707826	.707911	8
511	2.708421	2.708506	2.708591	2.708676	2.708761	8
512	.709270	.709355	.709440	.709524	.709609	8
513	.710117	.710202	.710287	.710371	.710456	8
514	.710963	.711048	.711132	.711216	.711301	8
515	.711807	.711891	.711976	.712060	.712144	8
516	.712650	.712734	.712818	.712902	.712986	8
517	.713490	.713574	.713658	.713742	.713836	8

Num	5	6	7	8	9	Diff.
480	2.681693	2.681784	2.681874	2.681964	2.682055	90
481	.682596	.682686	.682777	.682867	.682957	90
482	.683497	.683587	.683677	.683767	.683857	90
483	.684396	.684486	.684576	.684666	.684756	90
484	.685294	.685383	.685473	.685563	.685652	90
485	.686189	.686279	.686368	.686457	.686547	89
486	2.687083	2.687172	2.687261	2.687351	2.687440	89
487	.687975	.688064	.688153	.688242	.688331	89
488	.688865	.688953	.689042	.689131	.689220	89
489	.689753	.689841	.689930	.690019	.690107	89
490	.690639	.690727	.690816	.690905	.690993	89
491	.691523	.691612	.691700	.691788	.691877	88
492	2.692406	2.692494	2.692583	2.692671	2.692759	88
493	.693287	.693375	.693463	.693551	.693639	88
494	.694166	.694254	.694342	.694430	.694517	88
495	.695044	.695131	.695219	.695306	.695394	88
496	.695919	.696007	.696094	.696182	.696269	87
497	.696793	.696880	.696968	.697055	.697142	87
498	2.697665	2.697752	2.697839	2.697926	2.698013	87
499	.698535	.698622	.698709	.698796	.698883	87
500	.699404	.699491	.699578	.699664	.699751	87
501	.700271	.700357	.700444	.700531	.700617	87
502	.701136	.701222	.701309	.701395	.701482	86
503	.701999	.702086	.702172	.702258	.702344	86
504	2.702861	2.702947	2.703033	2.703119	2.703205	86
505	.703721	.703807	.703893	.703979	.704065	86
506	.704579	.704665	.704751	.704837	.704922	86
507	.705436	.705522	.705607	.705693	.705778	86
508	.706291	.706376	.706462	.706547	.706632	85
509	.707144	.707229	.707315	.707400	.707485	85
510	.707996	.708081	.708166	.708251	.708336	85
511	2.708846	2.708931	2.709015	2.709100	2.709185	85
512	.709694	.709779	.709863	.709948	.710033	85
513	.710540	.710625	.710710	.710794	.710879	85
514	.711385	.711470	.711554	.711638	.711723	84
515	.712229	.712313	.712397	.712481	.712565	84
516	.713070	.713154	.713238	.713322	.713406	84
517	.713910	.713994	.714078	.714162	.714246	8

Num	0	1	2	3	4	Diff.
518	2.714330	2.714414	2.714497	2.714581	2.714665	84
519	.715167	.715251	.715335	.715418	.715502	84
520	.716003	.716087	.716170	.716254	.716337	83
521	.716838	.716921	.717004	.717088	.717171	83
522	.717670	.717754	.717837	.717920	.718003	83
523	.718502	.718585	.718668	.718751	.718834	83
524	2.719331	2.719414	2.719497	2.719580	2.719663	83
525	.720159	.720242	.720325	.720407	.720490	83
526	.720986	.721068	.721151	.721233	.721316	82
527	.721811	.721893	.721975	.722058	.722140	82
528	.722634	.722716	.722798	.722881	.722963	82
529	.723456	.723538	.723620	.723702	.723784	82
530	2.724276	2.724358	2.724440	2.724522	2.724603	82
531	.725094	.725176	.725258	.725340	.725421	82
532	.725912	.725993	.726075	.726156	.726238	82
533	.726727	.726809	.726890	.726972	.727053	81
534	.727541	.727623	.727704	.727785	.727866	81
535	.728354	.728435	.728516	.728597	.728678	81
536	2.729165	2.729246	2.729327	2.729408	2.729489	81
537	.729974	.730055	.730136	.730217	.730298	81
538	.730782	.730863	.730944	.731024	.731105	81
539	.731589	.731669	.731750	.731830	.731911	81
540	.732394	.732474	.732555	.732635	.732715	80
541	.733197	.733277	.733358	.733438	.733518	80
542	2.733999	2.734079	2.734159	2.734240	2.734320	80
543	.734800	.734880	.734960	.735040	.735120	80
544	.735599	.735679	.735758	.735838	.735918	80
545	.736396	.736476	.736556	.736635	.736715	80
546	.737193	.737272	.737352	.737431	.737511	79
547	.737987	.738067	.738146	.738225	.738305	79
548	.738781	.738860	.738939	.739018	.739097	79
549	2.739572	2.739651	2.739730	2.739810	2.739889	79
550	.740363	.740442	.740521	.740599	.740678	79
551	.741152	.741230	.741309	.741388	.741467	79
552	.741939	.742018	.742096	.742175	.742254	79
553	.742725	.742804	.742882	.742961	.743039	78
554	.743510	.743588	.743666	.743745	.743823	78
555	.744293	.744371	.744449	.744528	.744606	78

Num	5	6	7	8	9	Diff.
518	2.714749	2.714832	2.714916	2.715000	2.715084	84
519	·715586	·715669	·715753	·715836	·715920	84
520	·716421	·716504	·716588	·716671	·716754	83
521	·717254	·717338	·717421	·717504	·717587	83
522	·718086	·718169	·718253	·718336	·718419	83
523	·718917	·719000	·719083	·719165	·719248	83
524	2.719745	2.719828	2.719911	2.719994	2.720077	83
525	·720573	·720655	·720738	·720821	·720903	83
526	·721398	·721481	·721563	·721646	·721728	82
527	·722222	·722305	·722387	·722469	·722552	82
528	·723045	·723127	·723209	·723291	·723374	82
529	·723866	·723948	·724030	·724112	·724194	82
530	2.724685	2.724767	2 724849	2.724931	2.725013	82
531	·725503	·725585	·725667	·725748	·725830	82
532	·726320	·726401	·726483	·726564	·726646	82
533	·727134	·727216	·727297	·727379	·727460	81
534	·727948	·728029	·728110	·728191	·728273	81
535	728759	·728841	·728922	·729003	·729084	81
536	2.729570	2.729651	2.729732	2.729813	2.729893	81
537	·730378	·730459	·730540	·730621	·730702	81
538	·731186	·731266	·731347	·731428	·731508	81
539	·731991	·732072	·732152	·732233	·7322[illegible]	81
540	·732796	·732876	·732956	·733037	·733117	80
541	·733598	·733679	·733759	·733839	·733919	80
542	2.734400	2.734480	2.734560	2.734640	2.734720	80
543	·735200	·735279	·735359	·735439	·735519	80
544	·735998	·736078	·736157	·736237	·736317	80
545	·736795	·736874	·736954	·737034	·737113	80
546	·737590	·737670	·737749	·737829	·737908	79
547	·738384	·738463	·738543	·738622	·738701	79
548	·739177	·739256	·739335	·739414	·739493	79
549	2.739968	2.740047	2.740126	2.740205	2.740284	79
550	·740757	·740836	·740915	·740994	·741073	79
551	·741546	·741624	·741703	·741782	·741860	79
552	·742332	·742411	·742489	·742568	·742647	79
553	·743118	·743196	·743275	·743353	·743431	78
554	·743902	·743980	·744058	·744136	·744215	78
555	·744684	·744762	·744840	·744919	·744997	78

A Table of Logarithms,

Num	0	1	2	3	4	Dift.
556	2.745075	2.745153	2.745231	2.745309	2.745387	78
557	.745855	.745933	.746011	.746089	.746167	78
558	.746634	.746712	.746790	.746868	.746945	78
559	.747412	.747489	.747567	.747645	.747722	78
560	.748188	.748266	.748343	.748421	.748498	77
561	.748963	.749040	.749118	.749195	.749272	77
562	2.749736	2.749814	2.749891	2.749968	2.750045	77
563	.750508	.750586	.750663	.750740	.750817	77
564	.751279	.751356	.751433	.751510	.751587	77
565	.752048	.752125	.752202	.752279	.752356	77
566	.752816	.752893	.752970	.753047	.753123	77
567	.753583	.753660	.753736	.753813	.753889	77
568	2.754348	2.754425	2.754501	2.754578	2.754654	76
569	.755112	.755189	.755265	.755341	.755417	76
570	.755875	.755951	.756027	.756103	.756180	76
571	.756636	.756712	.756788	.756864	.756940	76
572	.757396	.757472	.757548	.757624	.757700	76
573	.758155	.758230	.758306	.758382	.758458	76
574	2.758912	2.758988	2.759063	2.759139	2.759214	76
575	.759668	.759743	.759819	.759894	.759970	75
576	.760422	.760498	.760573	.760649	.760724	75
577	.761176	.761251	.761326	.761402	.761477	75
578	.761928	.762003	.762078	.762153	.762228	75
579	.762679	.762754	.762829	.762904	.762978	75
580	2.763428	2.763503	2.763578	2.763653	2.763727	75
581	.764176	.764251	.764326	.764400	.764475	75
582	.764923	.764998	.765072	.765147	.765221	75
583	.765669	.765743	.765818	.765892	.765966	74
584	.766413	.766487	.766562	.766636	.766710	74
585	.767156	767230	.767304	.767379	.767453	74
586	.767898	.767972	.768046	.768120	.768194	74
587	2.768638	2.768712	2.768786	2.768860	2.768934	74
588	.769377	.769451	.769525	.769599	.769673	74
589	.770115	.770189	.770263	.770336	.770410	74
590	.770852	.770926	.770999	.771073	.771146	74
591	.771587	.771661	.771734	.771808	.771881	73
592	.772322	.772395	.772468	.772542	.772615	73
593	.773055	.773128	.773201	.773274	.773348	73

Num	5	6	7	8	9	Diff
556	2.745465	2.745543	2.745621	2.745699	2.745777	78
557	.746245	.746323	.746401	.746479	.746556	78
558	.747023	.747101	.747179	.747256	.747334	78
559	.747800	.747878	.747955	.748033	.748110	78
560	.748576	.748653	.748731	.748808	.748885	77
561	.749350	.749427	.749504	.749582	.749659	77
562	2.750123	2.750200	2.750277	2.750354	2.750431	77
563	.750894	.750971	.751048	.751125	.751202	77
564	.751664	.751741	.751818	.751895	.751972	77
565	.752433	.752509	.752586	.752663	.752740	77
566	.753200	.753277	.753353	.753430	.753506	77
567	.753966	.754042	.754119	.754195	.754272	77
568	2.754730	2.754807	2.754883	2.754960	2.755036	76
569	.755494	.755570	.755646	.755722	.755799	76
570	.756256	.756332	.756408	.756484	.756560	76
571	.757016	.757092	.757168	.757244	.757320	76
572	.757775	.757851	.757927	.758003	.758079	76
573	.758533	.758609	.758685	.758761	.758836	76
574	2.759290	2.759366	2.759441	2.759517	2.759592	76
575	.760045	.760121	.760196	.760272	.760347	75
576	.760799	.760875	.760950	.761025	.761101	75
577	.761552	.761627	.761702	.761778	.761853	75
578	.762303	.762378	.762453	.762529	.762604	75
579	.763053	.763128	.763203	.763278	.763353	75
580	2.763802	2.763877	2.763952	2.764027	2.764101	75
581	.764550	.764624	.764699	.764774	.764848	75
582	.765296	.765370	.765445	.765520	.765594	75
583	.766041	.766115	.766190	.766264	.766338	74
584	.766785	.766859	.766933	.767007	.767082	74
585	.767527	.767601	.767675	.767749	.767823	74
586	.768268	.768342	.768416	.768490	.768564	74
587	2.769008	2.769082	2.769156	2.769230	2.769303	74
588	.769746	.769820	.769894	.769968	.770042	74
589	.770484	.770557	.770631	.770705	.770778	74
590	.771220	.771293	.771367	.771440	.771514	74
591	.771955	.772028	.772102	.772175	.772248	73
592	.772688	.772762	.772835	.772908	.772981	73
593	.773421	.773494	.773567	.773640	.773713	73

A Table of Logarithms,

Num	0	1	2	3	4	Diff
594	2.773786	2.773860	2.773933	2.774006	2.774079	73
595	.774517	.774590	.774663	.774736	.774809	73
596	.775246	.775319	.775392	.775465	.775538	73
597	.775974	.776047	.776120	.776193	.776265	73
598	.776701	.776774	.776846	.776919	.776992	73
599	.777427	.777499	.777572	.777644	.777717	72
600	2.778151	2.778224	2.778296	2.778368	2.778441	72
601	.778874	.778947	.779019	.779091	.779163	72
602	.779596	.779669	.779741	.779813	.779885	72
603	.780317	.780389	.780461	780533	.780605	72
604	.781037	.781109	.781181	.781253	.781324	72
605	.781755	.781827	.781899	.781971	782042	72
606	2.782473	2.782544	2.782616	2.782688	2.782759	72
607	.783189	.783260	.783332	.783403	.783475	71
608	.783904	.783975	.784046	.784118	.784189	71
609	.784617	.784689	.784760	.784831	.784902	71
610	.785330	.785401	.785472	.785543	.785615	71
611	.786041	.786112	.786183	.786254	.786325	71
612	2.786751	2.786822	2.786893	2.786964	2.787035	71
613	.787460	.787531	.787602	.787673	.787744	71
614	.788168	.788239	.788310	.788381	.788451	71
615	.788875	.788946	.789016	.789087	.789157	71
616	.789581	.789651	.789722	.789792	.789863	70
617	.790285	.790356	.790426	.790496	.790567	70
618	2.790988	2.791059	2.791129	2,791199	2.791269	70
619	.791691	.791761	.791831	.791901	.791971	70
620	.792392	.792462	.792532	.792602	.792672	70
621	.793092	.793162	.793231	.793301	.793371	70
622	.793790	.793860	.793930	.794000	.794070	70
623	.794488	.794558	.794627	.794697	.794767	70
624	.795185	.795254	.795324	.795393	.795463	70
625	2.795880	2.795949	2.796019	2.796088	2.796158	69
626	.796574	.796644	.796713	.796782	.796852	69
627	.797268	.797337	.797406	.797475	.797545	69
628	.797960	.798029	.798098	.798167	.798236	69
629	.798651	.798720	.798789	.798858	.798927	69
630	.799341	.799409	.799478	.799547	.799616	69
631	.800029	.800098	.800167	.800236	.800305	69

Num	5	6	7	8	9	Diff.
594	2.774152	2.774225	2.774298	2.774371	2.774444	73
595	.774882	.774955	.775028	.775100	.775173	73
596	.775610	.775683	.775756	.775829	.775902	73
597	.776338	.776411	.776483	.776556	.776629	73
598	.777064	.777137	.777209	.777282	.777354	73
599	.777789	.777862	.777934	.778006	.778079	72
600	2.778513	2.778585	2.778658	2.778730	2.778802	72
601	.779236	.779308	.779380	.779452	.779524	72
602	.779957	.780029	.780101	.780173	.780245	72
603	.780677	.780749	.780821	.780893	.780965	72
604	.781396	.781468	.781540	.781612	.781684	72
605	.782114	.782186	.782258	.782329	.782401	72
606	2.782831	2.782902	2.782974	2.783046	2.783117	72
607	.783546	.783618	.783689	.783761	.783832	71
608	.784261	.784332	.784403	.784475	.784546	71
609	.784974	.785045	.785116	.785187	.785259	71
610	.785686	.785757	.785828	.785899	.785970	71
611	.786396	.786467	.786538	.786609	.786680	71
612	2.787106	2.787177	2.787248	2.787319	2.787390	71
613	.787815	.787885	.787956	.788027	.788098	71
614	.788522	.788593	.788663	.788734	.788804	71
615	.789228	.789299	.789369	.789440	.789510	71
616	.789933	.790003	.790074	.790144	.790215	70
617	.790637	.790707	.790778	.790848	.790918	70
618	2.791340	2.791410	2.791480	2.791550	2.791620	70
619	.792041	.792111	.792181	.792252	.792322	70
620	.792742	.792812	.792882	.792952	.793022	70
621	.793441	.793511	.793581	.793651	.793721	70
622	.794139	.794209	.794279	.794349	.794418	70
623	.794836	.794906	.794976	.795045	.795115	70
624	.795532	.795602	.795671	.795741	.795810	70
625	2.796227	2.796297	2.796366	2.796436	2.796505	69
626	.796921	.796990	.797060	.797129	.797198	69
627	.797614	.797683	.797752	.797821	.797890	69
628	.798305	.798374	.798443	.798512	.798582	69
629	.798996	.799065	.799134	.799203	.799272	69
630	.799685	.799754	.799823	.799892	.799960	69
631	.800373	.800442	.800511	.800580	.800648	69

A Table of Logarithms,

Num	0	1	2	3	4	Diff.
632	2.800717	2.800786	2.800854	2.800923	2.800992	69
633	.801404	.801472	.801541	.801609	.801678	69
634	.802089	.802158	.802226	.802295	.802368	68
635	.802774	.802842	.802910	.802979	.803047	68
636	.803457	.803525	.803594	.803662	.803730	68
637	.804139	.804208	.804276	.804344	.804412	68
638	2.804821	2.804889	2.804957	2.805025	2.805093	68
639	.805501	.805569	.805637	.805705	.805773	68
640	.806180	.806248	.806316	.806384	.806451	68
641	.806858	.806926	.806994	.807061	.807129	68
642	.807535	.807603	.807670	.807738	.807806	68
643	.808211	.808279	.808346	.808414	.808481	67
644	2.808886	2.808953	2.809021	2.809088	2.809155	67
645	.809560	.809627	.809694	.809762	.809829	67
646	.810232	.810300	.810367	.810434	.810501	67
647	.810904	.810971	.811038	.811106	.811173	67
648	.811575	.811642	.811709	.811776	.811843	67
649	.812245	.812312	.812378	.812445	.812512	67
650	2.812913	2.812980	2.813047	2.813114	2.813180	67
651	.813581	.813648	.813714	.813781	.813848	67
652	.814248	.814314	.814381	.814447	.814514	67
653	.814913	.814980	.815046	.815113	.815179	66
654	.815578	.815644	.815710	.815777	.815843	66
655	.816241	.816308	.816374	.816440	.816506	66
656	2.816904	2.816970	2.817036	2.817102	2.817169	66
657	.817565	.817631	.817698	.817764	.817830	66
658	.818226	.818292	.818358	.818424	.818490	66
659	.818885	.818951	.819017	.819083	.819149	66
660	.819544	.819610	.819675	.819741	.819807	66
661	.820201	.820267	.802333	.820398	.820464	66
662	.820858	.820924	.820989	.821055	.821120	66
663	2.821513	2.821579	2.821644	2.821710	2.821775	65
664	.822168	.822233	.822299	.822364	.822430	65
665	.822822	.822887	.822952	.823017	.823083	65
666	.823474	.823539	.823605	.823670	.823735	65
667	.824126	.824191	.824256	.824321	.824386	65
668	.824776	.824841	.824906	.824971	.825036	65
669	.825426	.825491	.825556	.825621	.825686	65

Num	5	6	7	8	9	Diff.
632	2.801060	2.801129	2.801198	2.801267	2.801335	69
633	.801747	.801815	.801884	.801952	.802021	69
634	.802432	.802500	.802568	.802637	.802705	68
635	.803116	.803184	.803252	.803321	.803389	68
636	.803798	.803867	.803935	.804003	.804071	68
637	.804480	.804548	.804616	.804685	.804753	68
638	2.805161	2.805229	2.805297	2.805365	2.805433	68
639	.805840	.805908	.805976	.806044	.806112	68
640	.806519	.806587	.806655	.806723	.806790	68
641	.807197	.807264	.807332	.807400	.807467	68
642	.807873	.807941	.808008	.808076	.808143	68
643	.808548	.808616	.808683	.808751	.808818	67
644	2 809223	2.809290	2.809358	2.809425	2.809492	67
645	.809896	.809963	.810031	.810098	.810165	67
646	.810568	.810636	.810703	.810770	.810837	67
647	.811240	.811307	.811374	.811441	.811508	67
648	.811910	.811977	.812044	.812111	.812178	67
649	.812579	.812646	.812713	.812780	.812846	67
650	2 813247	2.813314	2.813381	2.813447	2.813514	67
651	.813914	.813981	.814048	.814114	.814181	67
652	.814580	.814647	.814714	.814780	.814847	67
653	.815246	.815312	.815378	.815445	.815511	66
654	.815910	.815976	.816042	.816109	.816175	66
655	.816573	.816639	.816705	.816771	.816838	66
656	2.817235	2.817301	2.817367	2.817433	2.817499	66
657	.817896	.817962	.818028	.818094	.818160	66
658	.818556	.818622	.818688	.818754	.818819	66
659	.819215	.819281	.819346	.819412	.819478	66
660	.819873	.819939	.820004	.820070	.820136	66
661	.820530	.820595	.820661	.820727	.820792	66
662	.821186	.821251	.821317	.821382	.821448	66
663	2.821841	2.821906	2.821972	2.822037	2.822103	65
664	.822495	.822560	.822626	.822691	.822756	65
665	.823148	823213	.823279	.823344	.823409	65
666	.823800	.823865	.823930	.823996	.824061	65
667	.824451	.824516	.824581	.824646	.824711	65
668	.825101	.825166	.825231	.825296	.825361	65
669	.825751	.825815	.825880	.825945	.826010	65

A Table of Logarithms,

Num	0	1	2	3	4	Diff.
670	2.826075	2.826140	2.826204	2.826269	2.826334	65
671	.826722	.826787	.826852	.826917	.826981	65
672	.827369	.827434	.827498	.827563	.827628	65
673	.828015	.828080	.828144	.828209	.828273	64
674	.828660	.828724	.828789	.828853	.828918	64
675	.829304	.829368	.829432	.829497	.829561	64
676	2.829947	2.830011	2.830075	2.830139	2.830204	64
677	.830589	.830653	.830717	.830781	.830845	64
678	.831230	.831294	.831358	.831422	.831486	64
679	.831870	.831934	.831998	.832062	.832125	64
680	.832509	.832573	.832637	.832700	.832764	64
681	.833147	.833211	.833275	.833338	.833402	64
682	2.833784	2.833848	2.833912	2.833975	2.834039	64
683	.834421	.834484	.834548	.834611	.834675	64
684	.835056	.835120	.835183	.835246	.835310	63
685	.835691	.835754	.835817	.835881	.835944	63
686	.836324	.836387	.836451	.836514	.836577	63
687	.836957	.837090	.837083	.837146	.837209	63
688	2.837588	2.837652	2.837715	2.837778	2.837841	63
689	.838219	.838282	.838345	.838408	.838471	63
690	.838849	.838912	.838975	.839038	.839101	63
691	.839478	.839541	.839604	.839667	.839729	63
692	.840106	.840169	.840232	.840294	.840357	63
693	.840733	.840796	.840859	.840921	.840984	63
694	2.841359	2.841422	2.841485	2.841547	2.841610	63
695	.841985	.842047	.842110	.842172	.842235	62
696	.842609	.842672	.842734	.842796	.842859	62
697	.843233	.843295	.843357	.843420	.843482	62
698	.843855	.843918	.843980	.844042	.844104	62
699	.844477	.844539	.844601	.844663	.844726	62
700	.845098	.845160	.845222	.845284	.845346	62
701	2.845718	2.845780	2.845842	2.845904	2.845966	62
702	.846337	.846399	.846461	.846523	.846584	62
703	.846955	.847017	.847079	.847141	.847202	62
704	.847573	.847634	.847696	.847758	.847819	62
705	.848189	.848251	.848312	.848374	.848435	62
706	.848805	.848866	.848928	.848989	.849051	61
707	.849419	.849481	.849542	.849604	.849665	61

Num	5	6	7	8	9	Diff
670	2.826399	2.826464	2.826528	2.826593	2.826658	65
671	.827046	.827111	.827175	.827240	.827305	65
672	.827692	.827757	.827821	.827886	.827950	65
673	.828338	.828402	.828466	.828531	.828595	64
674	.828982	.829046	.829111	.829175	.829239	64
675	.829625	.829690	.829754	.829818	.829882	64
676	2.830268	2.830332	2.830396	2.830460	2.830524	64
677	.830909	.830973	.831037	.831102	.831166	64
678	.831550	.831614	.831678	.831742	.831806	64
679	.832189	.832253	.832317	.832381	.832445	64
680	.832828	.832892	.832956	.833019	.833083	64
681	.833466	.833530	.833593	.833657	.833721	64
682	2.834103	2.834166	2.834230	2.834293	2.834357	64
683	.834738	.834802	.834866	.834929	.834993	64
684	.835373	.835437	.835500	.835564	.835627	63
685	.836007	.836071	.836134	.836197	.836261	63
686	.836640	.836704	.836767	.836830	.836893	63
687	.837273	.837336	.837399	.837462	.837525	63
688	2.837904	2.837967	2 838030	2.838093	2.838156	63
689	.838534	.838597	.838660	.838723	.838786	63
690	.839164	.839227	.839289	.839352	.839415	63
691	.839792	.839855	.839918	.839981	.840043	63
692	.840420	.840482	.840545	.840608	.840671	63
693	.841046	.841109	.841172	.841234	.841297	63
694	2.841672	2.841735	2.841797	2.841860	2.841922	63
695	.842297	.842360	.842422	.842484	.842547	62
696	.842921	.842983	.843046	.843108	.843170	62
697	.843544	.843606	.843669	.843731	.843793	62
698	.844166	.844229	.844291	.844353	.844415	62
699	.844788	.844850	.844912	.844974	.845036	62
700	845408	.845470	.845532	.845594	.845656	62
701	2.846028	2.846090	2 846151	2.846213	2.846275	62
702	.846646	.846708	.846770	.846832	.846893	62
703	.847264	.847326	.847388	.847449	.847511	62
704	.847881	.847943	.848004	848066	.848127	62
705	.848497	.848559	.848620	.848682	.848743	62
706	.849112	.849174	.849235	.849296	.849358	61
707	.849726	.849788	.849849	.849911	.849972	61

Num	0	1	2	3	4	Diff
708	2.850033	2.850095	2.850156	2.850217	2.850279	61
709	.850646	.850707	.850769	.850830	.850891	61
710	.851258	.851319	.851381	.851442	.851503	61
711	.851870	.851931	.851992	.852053	.852114	61
712	.852480	.852541	.852602	.852663	.852724	61
713	.853089	.853150	.853211	.853272	.853333	61
714	2.853698	2.853759	2.853820	2.853881	2.853941	61
715	.854306	.854367	.854427	.854488	.854549	61
716	.854913	.854974	.855034	.855095	.855156	61
717	.855519	.855580	.855640	.855701	.855761	61
718	.856124	.856185	.856245	.856306	.856366	60
719	.856729	.856789	856850	.856910	.856970	60
720	2.857332	2.857393	2.857453	2.857513	2.857574	60
721	.857935	.857995	.858056	.858116	.858176	60
722	.858537	.858597	.858657	.858718	.858778	60
723	.859138	.859198	.859258	.859318	.859378	60
724	.859739	.859798	.859858	.859918	.859978	60
725	.860338	.860398	.860458	.860518	.860578	60
726	2.860937	2.860996	2.861056	2.861116	2.861176	60
727	.861534	.861594	.861654	.861714	.861773	60
728	.862131	.862191	.862251	.862310	.862370	60
729	.862727	.862787	.862847	.862906	.862966	60
730	.863323	.863382	.863442	.863501	.863561	59
731	.863917	.863977	.864036	.864096	.864155	59
732	2.864511	2.864570	2.864630	2.864689	2.864748	59
733	.865104	.865163	.865222	865282	.865341	59
734	.865696	.865755	.865814	.865873	.865933	59
735	.866287	.866346	.866405	.866465	.866524	59
736	.866878	.866937	.866996	.867055	.867114	59
737	.867467	.867526	.867585	.867644	.867703	59
738	.868056	.868115	.868174	.868233	.868292	59
739	2 868644	2.868703	2.868762	2.868821	2.868879	59
740	.869232	.869290	.869349	869408	.869466	59
741	.869818	.869877	.869935	.869994	.870053	59
742	.870404	.870462	.8 0521	.870579	.870638	58
743	.870989	.871047	.871106	.871164	.871223	58
744	.871573	.871631	.871690	.871748	.871806	58
745	.872156	.872215	.872273	.872331	.872389	58

um	5	6	7	8	9	Dift
708	2.850340	2.850401	2.850462	2.850524	2.850585	61
709	.850952	.851014	.851075	.851136	.851197	61
710	.851564	.851625	.851686	.851747	.851808	61
711	.852175	.852236	.852297	.852358	.852419	61
712	.852785	.852846	.852907	.852968	.853029	61
713	.853394	.853455	.853516	.853576	.853637	61
714	2.854002	2.854063	2.854124	2.854184	2.854245	61
715	.854610	.854670	.854731	.854792	.854852	61
716	.855216	.855277	.855337	.855398	.855459	61
717	.855822	.855882	.855943	.856003	.856064	61
718	.856427	.856487	.856548	.856608	.856668	60
719	.857031	.857091	.857151	.857212	.857272	60
720	2.857634	2.857694	2.857754	2.857815	2.857875	60
721	.858236	.858296	.858357	.858417	.858477	60
722	.858838	.858898	.858958	.859018	.859078	60
723	.859438	.859499	.859559	.859619	.859679	60
724	.860038	.860098	.860158	.860218	.860278	60
725	.860637	.860697	.860757	.860817	.860877	60
726	2.861236	2.861295	2.861355	2.861415	2.861475	60
727	.861833	.861893	.861952	.862012	.862072	60
728	.862430	.862489	.862549	.862608	.862668	60
729	.863025	.863085	.863144	.863204	.863263	60
730	.863620	.863680	.863739	.863798	.863858	59
731	.864214	.864274	.864333	.864392	.864452	59
732	2.864808	2.864867	2.864926	2.864985	2.865045	59
733	.865400	.865459	.865518	.865578	.865637	59
734	.865992	.866051	.866110	.866169	.866228	59
735	.866583	.866642	.866701	.866760	.866819	59
736	.867173	.867232	.867291	.867350	867409	59
737	.867762	.867821	.867880	.867939	.867997	59
738	.868350	.868409	.868468	.868527	.868586	59
739	2.868938	.868997	2.869056	2.869114	2.869173	59
740	.869525	.869584	.869642	.869701	.869760	59
741	.870111	.870170	.870228	.870287	870345	59
742	.870696	.870755	.870813	.870872	.870930	58
743	.871281	.871339	.871398	.871456	.871515	58
744	.871865	.871923	.871981	.872040	.872098	58
745	.872448	.872506	.872564	.872622	.872681	58

A Table of Logarithms,

Num	0	1	2	3	4	Diff.
746	2.872739	2.872797	2.872855	2.872913	2.872972	58
747	.873321	873379	.873437	.873495	.873553	58
748	.873902	.873960	.874018	.874076	.874134	58
749	.874482	.874540	.874598	.874656	.874714	58
750	.875061	.875119	.875177	.875235	.875293	58
751	.875640	.875698	.875756	.875813	.875871	58
752	2.876218	2.876276	2.876333	2.876391	2.876449	58
753	.876795	.876853	.876910	.876968	.877026	58
754	.877371	.877429	.877486	.877544	.877602	58
755	.877947	.878004	.878062	.878119	.878177	57
756	.878522	.878579	.878637	.878694	.878751	57
757	.87909	879153	.879211	.879268	.879325	57
758	2.879669	2.879726	2.879784	2.879841	2.879898	57
759	.880242	.880299	.880356	.880413	.880471	57
760	.880814	.880871	.880928	.880985	.881042	57
761	.881385	.881442	.881499	.881556	881613	57
762	.881955	882012	.882069	.882126	.882183	57
763	.882524	.882581	.882638	.882695	.882752	57
764	2.883093	2.883150	2.883207	2.883264	2.883321	57
765	.883661	.883718	.883775	.883832	.883889	57
766	.884229	.884285	.884342	.884399	.884455	57
767	.884795	.884852	.884909	.884965	.885022	57
768	.885361	.885418	.885474	.885531	885587	57
769	.885926	.885983	.886039	.886096	.886152	56
770	2.886491	2.886547	2.886603	2.886660	2.886716	56
771	.887054	.887111	.887167	.887223	.887280	56
772	.887617	.887673	.887730	.887786	.887842	56
773	.888179	.888236	.888292	.888348	.888404	56
774	.888741	.888797	.888853	.888909	888965	56
775	.889302	.889358	.889414	.889470	.889526	56
776	.889862	.889918	.889974	.890030	.890086	56
777	2.890421	2.890477	2.890533	2.890589	2.890644	56
778	.890980	.891035	.891091	.891147	.891203	56
779	.891537	.891593	.891649	.891705	.891760	56
780	.892095	.892150	.892206	.892262	.892317	56
781	.892651	.892707	.892762	.892818	.892873	56
782	.893207	.893262	.893318	.893373	.893429	56
783	.893762	.893817	.893873	.893928	.893984	55

Num	5	6	7	8	9	Diff.
746	2.873030	2.873088	2.873146	2.873204	2.873262	58
747	.873611	.873669	.873727	.873785	.873843	58
748	.874192	.874250	.874308	874366	.874424	58
749	.874772	.874830	.874887	.874945	.875003	58
750	.875351	.875409	.875466	.875524	.875582	58
751	.875929	.875987	876044	.876102	.876160	58
752	2.876506	2.876564	2.876622	2.876680	2.876737	58
753	.877083	.877141	.877198	877256	.877314	58
754	.877659	.877717	.877774	.877832	.877889	58
755	878234	.878292	.878349	.878407	.878464	57
756	.878809	.878866	.878922	.878981	.879038	57
757	879383	.879440	.879497	.879555	.879612	57
758	2.879956	2.880013	2 880070	2.880127	2.880185	57
759	.880528	.880585	.880642	.880699	.880756	57
760	.881099	.881156	.881213	.881270	.881328	57
761	.881670	.881727	.881784	.881841	.881898	57
762	.882240	882297	882354	.882411	.882468	57
763	.882809	.882866	.882923	.882980	.883036	57
764	2.883377	2.883434	2.883491	2.883548	2.883605	57
765	.883945	.884002	.884059	.884115	.884172	57
766	.884512	.884569	.884625	.884682	.884739	57
767	.885078	.885135	.885191	.885248	.885305	57
768	.885644	.885700	.885757	.885813	.885870	57
769	.886209	.886265	.886321	.886378	.886434	56
770	2.886773	2.886829	2.886885	2.886942	2.886998	56
771	.887336	.887392	.887449	.887505	.887561	56
772	.887898	.887955	.888011	.888067	.888123	56
773	.888460	.888516	.888573	.888629	.888685	56
774	.889021	.889077	.889133	889190	.889246	56
775	.889582	.889638	.889694	.889750	.889806	56
776	.890141	.890197	.890253	890309	.890365	56
777	2.890700	2.890755	2.890812	2.890868	2.890924	56
778	.891259	.891314	.891370	.891426	.891482	56
779	.891816	.891872	.891927	.891983	.892039	56
780	.892373	.892428	.892484	.892540	.892595	56
781	.892929	.892985	893040	893096	.893151	56
782	.893484	.893540	.893595	.893651	.893706	56
783	.894039	.894094	.894150	.894205	.894261	55

A Table of Logarithms,

Num	0	1	2	3	4	Diff.
784	2.894316	2.894371	2.894427	2.894482	2.894538	55
785	.894870	.894925	.894980	.895036	.895091	55
786	.895422	.895478	.895533	.895588	.895643	55
787	.895975	.896030	.896085	.896140	.896195	55
788	.896526	.896581	.896636	.896691	.896747	55
789	.897077	.897132	.897187	.897242	.897297	55
790	2.897627	2.897682	2.897737	2.897792	2.897847	55
791	.898176	.898231	.898286	.898341	.898396	55
792	.898725	.898780	.898835	.898890	.898944	55
793	.899273	.899328	.899383	.899437	.899492	55
794	.899820	.899875	.899930	.899985	.900039	55
795	.900367	.900422	.900476	.900531	.900586	55
796	2.900913	2.900968	2.901022	2.901077	2.901131	55
797	.901458	.901513	.901567	.901622	.901676	54
798	.902003	.902057	.902112	.902166	.902220	54
799	.902547	.902601	.902655	.902710	.902764	54
800	.903090	.903144	.903198	.903253	.903307	54
801	.903632	.903687	.903741	.903795	.903849	54
802	2.904174	2.904228	2.904283	2.904337	2.904391	54
803	.904715	.904770	.904824	.904878	.904932	54
804	.905256	.905310	.905364	.905418	.905472	54
805	.905796	.905850	.905904	.905958	.906012	54
806	.906335	.906389	.906443	.906497	.906550	54
807	.906873	.906927	.906981	.907035	.907089	54
808	2.907411	2.907465	2.907519	2.907573	2.907626	54
809	.907948	.908002	.908056	.908109	.908163	54
810	.908485	.908539	.908592	.908646	.908699	54
811	.909021	.909074	.909128	.909181	.909235	53
812	.909556	.909609	.909663	.909716	.909770	53
813	.910090	.910144	.910197	.910251	.910304	53
814	.910624	.910678	.910731	.910784	.910838	53
815	2.911158	2.911211	2.911264	2.911317	2.911371	53
816	.911690	.911743	.911797	.911850	.911903	53
817	.912222	.912275	.912328	.912381	.912435	53
818	.912753	.912806	.912859	.912912	.912966	53
819	.913284	.913337	.913390	.913443	.913496	53
820	.913814	.913867	.913920	.913973	.914026	53
821	.914343	.914396	.914449	.914502	.914555	53

Num	5	6	7	8	9	Diff
784	2.894593	2.894648	2.894704	2.894759	2.894814	55
785	.895146	.895201	.895257	.895312	.895367	55
786	.895699	.895754	.895809	.895864	.895919	55
787	.896251	.896306	.896361	.896416	.896471	55
788	.896802	.896857	.896912	.896967	.897022	55
789	.897352	.897407	.897462	.897517	.897572	55
790	2.897902	2.897957	2.898012	2.898067	2.898122	55
791	.898451	.898506	.898561	.898615	.898670	55
792	.898999	.899054	.899109	.899164	.899218	55
793	.899547	.899602	.899656	.899711	.899766	55
794	.900094	.900149	.900203	.900258	.900312	55
795	.900640	.900695	.900749	.900804	.900858	55
796	2.901186	2.901240	2.901295	2.901349	2.901404	55
797	.901731	.901785	.901840	.901894	.901948	54
798	.902275	.902329	.902384	.902438	.902492	54
799	.902818	.902873	.902927	.902981	.903036	54
800	.903361	.903416	.903470	.903524	.903578	54
801	.903903	.903958	.904012	.904066	.904120	54
802	2.904445	2.904499	2.904553	2.904607	2.904661	54
803	.904986	.905040	.905094	.905148	.905202	54
804	.905526	.905580	.905634	.905688	.905742	54
805	.906065	.906119	.906173	.906227	.906281	54
806	.906604	.906658	.906712	.906766	.906820	54
807	.907142	907196	.907250	.907304	.907358	54
808	2 907680	2.907734	2.907787	2.907841	2.907895	54
809	.908217	.908270	.908324	.908378	.908431	54
810	.908753	.908807	.908860	.908914	.908967	54
811	.909288	.909342	.909395	.909449	.909502	54
812	.909823	.909877	.909930	.909984	.910037	5
813	.910358	.910411	.910464	.910518	.910571	5
814	.910891	.910944	.910998	911051	.911104	5
815	2.911424	2.911477	2.911530	2.911584	2.911637	5
816	.911956	.912009	.912063	.912116	.912169	5
817	.912488	.912541	.912594	.912647	.912700	5
818	.913019	.913072	.913125	.913178	.913231	5
819	.913549	913602	.913655	.913708	.913761	5
820	.914079	.914131	.914184	.914237	.914290	5
821	.914608	.914660	.914713	.914766	.914819	5

Num	0	1	2	3	4	Diff.
822	2.914872	2.914925	2.914977	2.915030	2.915083	53
823	.915400	.915453	.915505	.915558	.915611	53
824	.915927	.915980	.916033	.916085	.916138	53
825	.916454	.916507	.916559	.916612	.916664	53
826	.916980	.917033	.917085	.917138	.917190	53
827	.917505	917558	.917610	.917663	.917715	52
828	2.918030	2.918083	2.918135	2.918188	2.918240	52
829	.918554	.918607	.918659	.918712	.918764	52
830	.919078	.919130	.919183	.919235	.919287	52
831	.919601	.919653	.919705	.919758	.919810	52
832	.920123	.920175	.920228	.920280	.920332	52
833	.920645	.920697	920749	.920801	.920853	52
834	2.921166	2.921218	2.921270	2.921322	2.921374	52
835	.921686	.921738	.921790	.921842	.921894	52
836	.922206	.922258	.922310	.922362	.922414	52
837	.922725	.922777	.922829	.922881	.922933	52
838	.923244	.923296	.923348	.923399	.923451	52
839	.923762	.923814	.923865	.923917	.923969	52
840	2.924279	2.924331	2.924383	2.924434	2.924486	52
841	.924796	.924848	.924899	.924951	.925002	52
842	.925312	.925364	.925415	.925467	.925518	52
843	.925828	.925879	.925931	.925982	.926034	51
844	926342	.926394	.926445	.926497	.926548	51
845	.926857	.926908	.926959	.927011	.927062	51
846	2.927370	2.927422	2.927473	2.927524	2.927576	51
847	.927883	.927935	.927986	.928037	.928088	51
848	.928396	.928447	.928498	.928549	.928601	51
849	.928908	.928959	.929010	.929061	.929112	51
850	.929419	.929470	.929521	.929572	.929623	51
851	.929930	.929981	.930032	.930083	.930134	51
852	.930440	.930491	93054	.930592	.930643	51
853	2.930949	2.931000	2.931051	2.931102	2.931153	51
854	.931458	931509	.931560	.931610	.931661	51
855	.931966	.932017	.932068	.932118	.932169	51
856	.932474	.932524	.932575	.932626	.932677	51
857	.932981	93303	.933082	.933133	933183	51
858	.933487	.933538	.933588	.933639	.933690	51
859	.933993	.934044	.934094	.934145	.934195	51

Num	5	6	7	8	9	Diff.
822	2.915136	2.915189	2.915241	2.915294	2.915347	53
823	.915664	.915716	.915769	.915822	.915874	53
824	.916191	.916243	.916296	.916349	.916401	53
825	.916717	.916770	.916822	.916875	.916927	53
826	.917243	.917295	.917348	.917400	.917453	53
827	.917768	.917820	.917873	.917925	.917978	52
828	2.918292	2.918345	2.918397	2.918450	2.918502	52
829	.918816	.918869	.918921	.918973	.919026	52
830	.919340	.919392	.919444	.919496	.919549	52
831	.919862	.919914	.919967	.920019	.920071	52
832	.920384	.920436	.920489	.920541	.920593	52
833	.920906	.920958	.921010	.921062	.921114	52
834	2.921426	2.921478	2.921530	2.921582	2.921634	52
835	.921946	.921998	.922050	.922102	.922154	52
836	.922466	.922518	.922570	.922622	.922674	52
837	.922985	.923037	.923088	.923140	.923192	52
838	.923503	.923555	.923607	.923658	.923710	52
839	.924021	.924072	.924124	.924176	.924228	52
840	2.924538	2.924589	2.924641	2 924693	2.924744	52
841	.925054	.925106	.925157	.925209	.925260	52
842	.925570	.925621	.925673	.925724	.925776	52
843	.926085	.926137	.926188	.926239	.926291	51
844	.926600	.926651	.926702	.926754	.926805	51
845	.927114	.927165	.927216	.927268	.927319	51
846	2.927627	2.927678	2.927730	2.927781	2.927832	51
847	.928140	.928191	.928242	.928293	.928345	51
848	.928652	.928703	.928754	.928805	.928856	51
849	.929163	.929214	.929266	.929317	.929368	51
850	.929674	.929725	.929776	.929827	.929878	51
851	.930185	.930236	.930287	.930338	.930389	51
852	.930694	.930745	.930796	.930847	.930898	51
853	2.931205	2.931254	2.931305	2.931356	2 931407	51
854	.931712	.931763	.931814	.931864	.931915	51
855	.932220	.932271	.932321	932372	.932423	51
856	.932727	.932778	.932829	.932879	.932930	51
857	.933234	.933285	.933335	.933386	.933437	51
858	.933740	.933791	.933841	.933892	.933943	51
859	.934246	.934296	934347	.934397	.934448	51

A Table of Logarithms,

Num	0	1	2	3	4	Diff.
860	2.934498	2.934549	2.934599	2.934650	2.934700	50
861	.935003	.935054	.935104	.935154	.935205	50
862	.935507	.935558	.935608	.935658	.935709	50
863	.936011	.936061	.936111	.936162	.936212	50
864	.936514	.936564	.936614	.936664	.936715	50
865	.937016	.937066	.937116	.937167	.937217	50
866	2.937518	2.937568	2.937618	2.937668	2.937718	50
867	.938019	.938069	.938119	.938169	.938219	50
868	.938520	.938570	.938620	.938706	.938720	50
869	.939020	.939070	.939120	.939170	.939220	50
870	.939519	.939569	.939619	.939669	.939719	50
871	.940018	.940068	.940118	.940168	.940218	50
872	2.940516	2.940566	2.940616	2.940666	2.940716	50
873	.941014	.941064	.941114	.941163	.941213	50
874	.941511	.941561	.941611	.941660	.941710	50
875	.942008	.942058	.942107	.942157	.942206	50
876	.942504	.942554	.942603	.942653	.942702	50
877	.943000	.943049	.943099	.943148	.943198	49
878	2.943494	2 943544	2.943593	2.943643	2.943692	49
879	.943989	.944038	.944088	.944137	.944186	49
880	.944483	.944532	.944581	.944631	.944690	49
881	.944976	.945025	.945074	.945124	.945173	49
882	.945469	.945518	.945567	.945616	.945665	49
883	.945961	.946010	.946059	.946108	.946157	49
884	2 946452	2.946501	2.946550	2.946600	2.946649	49
885	.946943	.946992	.947041	.947090	.947139	49
886	.947434	.947483	.947532	.947581	.947630	49
887	.947924	.947973	.948021	.948070	.948119	49
888	.948413	.948462	.948511	.948560	.948608	49
889	.948902	.948951	.948999	.949048	.949097	49
890	.949390	.949439	.949488	.949536	.949585	49
891	2.949878	2.949926	2.949975	2.950023	2.950073	49
892	.950365	.950413	.950462	.950511	.950560	49
893	.950851	.950900	.950949	.950997	.951046	49
894	.951337	.951386	.951435	.951483	.951532	49
895	.951823	.951872	.951920	.951969	.952017	49
896	.952308	.952356	.952405	.952453	.952502	48
897	.952792	.952841	.952889	.952938	.952986	48

Num.	5	6	7	8	9	Diff.
860	2.934751	2.934801	2 934852	2.934902	2.934953	50
861	.935255	.935306	.935356	.935406	.935457	50
862	.935759	.935809	.935860	.935910	.935960	50
863	.936262	.936313	.936363	.936413	.936463	50
864	.936765	.936815	.936865	.936916	.936966	50
865	.937267	.937317	.937367	.937418	.937468	50
866	2 937769	2.937819	2.937869	2.937919	2.937969	50
867	.938269	.938319	.938370	.938420	.938470	50
868	.938770	.938820	.938870	.938920	.938970	50
869	.939275	.939319	.939369	.939419	.939469	50
870	.939769	.939819	.939868	.939918	.939968	50
871	.940267	.940317	.940367	.940471	.940467	50
872	2.940765	2.940815	2.940865	2.940915	2.940964	50
873	.941263	.941313	.941362	.941412	.941462	50
874	.941760	.941809	.941859	.941909	.941958	50
875	.942256	.942306	.942355	.942405	.942454	50
876	.942752	.942801	.942851	.942900	.942950	50
877	.943247	.943297	.943346	.943396	.943445	49
878	2.943742	2.943791	2 943841	2.943890	2.943939	49
879	.944236	.944285	.944335	.944384	.944433	49
880	.944729	.944779	.944828	.944877	.944927	49
881	.945222	.945272	.945321	.945370	.945419	49
882	.945715	.945764	.945813	.945863	.945911	49
883	.946207	.946256	.946305	.946354	.946403	49
884	2.946698	2.945747	2.946796	2 946845	2 946894	49
885	.947189	.947238	.947287	.947336	.947385	49
886	.947679	.947728	.947777	.947826	.947875	49
887	.948168	.948217	.948266	.948315	.948364	49
888	.948657	.948706	.948755	.948804	.948853	49
889	.949146	.949195	.949244	.949292	.949341	49
890	.949633	.949683	.949731	.949780	.949829	49
891	2.950121	2.950170	2.950219	2.950267	2.950316	49
892	.950608	.950657	.950705	.950754	.950803	49
893	.951095	951143	.951192	.951240	.951289	49
894	.951580	.951629	.951677	.951726	.951774	49
895	.952066	.952114	.952163	.952211	.952259	48
896	.952550	.952599	.952647	.952696	.952744	48
897	.953034	.953083	.953131	.953180	.953228	48

A Table of Logarithms,

Num.	0	1	2	3	4	Diff
898	2.953276	2.953325	2.953373	2.953421	2.953470	48
899	.953760	.953808	.953856	.953905	.953953	48
900	.954242	.954291	.954339	.954387	.954435	48
901	.954725	.954773	.954821	.954869	.955918	48
902	.955206	.955255	.955303	.955351	.955399	48
903	.955688	955736	.955784	.955832	.955880	48
904	2.956108	2.956216	2.956264	2.956312	2.956360	48
905	.956649	.956697	.956744	.956792	.956840	48
906	.957128	.957176	.957224	.957272	.957320	48
907	.957607	.957655	.957707	.957751	.957799	48
908	.958086	.958134	.958181	.958229	.958277	48
909	.958564	.958612	.958659	.958707	.958755	48
910	2.959041	2.959089	2.959137	2.959184	2.959232	48
911	.959518	.959566	.959614	.959661	.959709	48
912	.959995	.960042	.960090	.960138	.960185	48
913	.960471	.960518	.960566	.960613	.960661	48
914	.960946	.960994	.961041	.961089	.961136	47
915	.961421	.961468	.961516	.961563	.961611	47
916	2.961890	2.961943	2.961990	2.962038	2.962085	47
917	.962369	.962417	.962464	.962511	.962559	47
918	962843	.962890	.962937	.962985	.963032	47
919	.9633[illegible]5	.963363	.963410	.963457	.963504	47
920	.963788	.963835	.963882	.963929	.963977	47
921	.964260	.964307	964354	.964401	.964448	47
922	2.964731	2.964778	2.964825	2.964872	2.964919	47
923	.965202	.965249	.965296	.965343	.965390	47
924	.965672	965719	.965766	.965813	.965860	47
925	.966142	.966189	.966236	.966283	.966329	47
926	.966611	.966658	.966705	.966752	.966798	47
927	967080	.967127	.967173	.967220	.967267	47
928	.967548	.967595	967642	.967688	.967735	47
929	2.968016	2.968062	2.968109	2.968156	2.968203	47
930	.968483	.968530	.968576	.968623	.968670	47
931	.968950	928996	.969043	.969090	.969136	47
932	.969416	.969462	.969509	.969556	.969602	47
933	.969882	.969928	.969975	.970031	.970068	47
934	.970347	.970393	.970440	.970486	970533	46
935	.970812	.970858	.970904	.970951	970997	46

Num	5	6	7	8	9	Diff
898	2.953518	2.953566	2.953615	2.953663	2.953711	48
899	.954001	.954049	.954098	.954146	.954194	48
900	.954484	.954532	.954580	.954628	.954677	48
901	.954966	.955014	.955062	.955110	.955158	48
902	.955447	.955495	.955543	.955591	.955640	48
903	.955928	.955976	.956024	.956072	.956120	48
904	2.956409	2.956457	2.956505	2.956553	2.956601	48
905	.956888	.956936	.956984	.957032	.957080	48
906	.957368	.957416	.957464	.957511	.957559	48
907	.957847	.957894	.957942	.957990	.958038	48
908	.958325	.958373	.958420	.958468	.958516	48
909	.958803	.958850	.958898	.958946	.958994	48
910	2.959280	2.959328	2.959375	2.959423	2.959471	48
911	.959757	.959804	.959852	.959900	.959947	48
912	.960233	.960280	.960328	.960376	.960423	48
913	.960708	.960756	.960804	.960851	.960899	48
914	.961184	.961231	.961279	.961326	.961374	47
915	.961658	.961706	.961753	.961801	.961848	47
916	2.962132	2.962180	2.962227	2.962275	2.962322	47
917	.962606	.962653	.962701	.962748	.962795	47
918	.963079	.963126	.963174	.963221	.963268	47
919	.963552	.963599	.963646	.963693	.963741	47
920	.964024	.964071	.964118	.964165	.964212	4
921	.964495	.964542	.964590	.964637	.964684	47
922	2.964966	2.965013	2.965060	2.965108	2.965155	47
923	.965437	.965484	.965531	965578	.965625	47
924	.965907	.965954	.966001	.966048	.966095	47
925	.966376	.966423	.966470	.966517	.966564	47
926	.966845	.966892	.966939	.966986	.967033	47
927	.967314	.967361	.967408	.967454	.967501	47
928	.967782	.967829	.967875	.967922	.967969	47
929	2.968249	2.968296	2.968343	2.968389	2.968436	47
930	.968716	.968763	.968810	.968856	.968903	47
931	.969183	.969229	.969276	.969323	.969369	47
932	.969649	.969695	.969742	.969788	.969835	47
933	.970114	.970161	.970207	.970254	.970360	47
934	.970579	.970626	.970672	.970719	.970765	46

A Table of Logarithms,

Num	0	1	2	3	4	Diff.
936	2.971276	2.971322	2.971369	2.971415	2.971461	46
937	.971740	.971786	.971832	.971879	.971925	46
938	.972203	.972249	.972295	.972342	.972388	46
939	.972665	.972712	.972758	.972804	.972851	46
940	.973128	.973174	.973220	.973266	.973313	46
941	.973590	973636	.973682	.973728	.973774	46
942	2.974051	2.974097	2.974143	2.974189	2.974235	46
943	.974512	.974558	.974604	.974650	.974696	46
944	.974972	.975018	.975064	.975110	.975156	46
945	.975432	.975478	.975524	.975570	.975616	46
946	.975891	.975937	.975983	.976029	.97607	46
947	.976350	.976396	.976442	.976487	.975533	46
948	2.976808	2.976854	2.976900	2.976946	2.976991	46
949	.977266	.977312	.977358	.977403	.977449	46
950	.977724	.977769	.977815	.977861	.977906	46
951	.978180	.978226	.978272	.978317	.978363	46
952	.978637	.978683	.978728	.978774	.978819	46
953	.979093	.979138	.979184	.979230	.979275	45
954	2.979548	2.979594	2.979639	2.979685	2.979730	46
955	.980003	.980049	.980094	.980140	.980185	45
956	.980458	.980503	.980549	.980594	.980640	45
957	980912	.980957	.981003	.981003	.981093	45
958	.981365	.981411	.981456	.981501	.981547	45
959	.981819	.981864	.981909	.981954	.982000	45
960	2 982271	2.982316	2.982362	2 982407	2.982452	45
961	.982723	.982769	.982814	.982859	.982904	45
962	.983175	.983220	.983265	.983310	.983356	45
963	.983626	983671	.983716	.983762	.983807	45
964	.984077	.984122	.984167	.984212	.984257	45
965	.984527	.984572	.984617	.984662	.984707	45
966	.984977	985022	.985067	.985112	.985157	45
967	2 985426	2.985471	2.985516	2.985561	2.985606	45
968	.985875	.985920	.985965	.986010	.986055	45
969	.986324	986369	.986413	.986458	.986503	45
970	.986772	.986816	.986861	.986906	.986951	45
971	.987219	.987264	.987309	.987353	.987398	45
972	.987666	.987711	.987756	.987800	.987845	45
973	.988113	.988157	.988202	.988247	.988291	45

Num	5	6	7	8	9	Diff.
936	2·971508	2·971554	2·971600	2·971647	2·971693	46
937	·971971	·972018	·972064	·972110	·972156	46
938	·972434	·972480	·972527	·972573	·972619	46
939	·972897	·972943	·972989	·973035	·973082	46
940	·973359	·973405	·973451	·973497	·973543	46
941	·973820	·973866	·973913	·973959	·974005	46
942	2·974281	2·974327	2·974373	2·974420	2·974466	46
943	·974742	·974788	·974834	·974880	·974926	46
944	·975202	·975248	·975294	·975340	·975386	46
945	·975661	·975707	·975753	·975799	·975845	46
946	·976121	·976166	·976212	·976258	·976304	46
947	·976579	·976625	·976671	·976717	·976762	46
948	2·977037	2·977083	2·977129	2·977175	2·977220	46
949	·977495	·977541	·977586	·977632	·977678	46
950	·977952	·977998	·978043	·978089	·978135	46
951	·978409	·978454	·978500	·978546	·978591	46
952	·978865	·978911	·978956	·979002	·979047	46
953	·979321	·979366	·979412	·979457	·979503	46
954	2·979776	2·979821	2·979867	2·979912	2·979958	46
955	·980231	·980276	·980322	·980367	·980412	45
956	·980685	·980730	·980776	·980821	·980867	45
957	·981139	·981184	·981229	·981275	·981320	45
958	·981592	·981637	·981683	·981728	·981773	45
959	·982045	·982090	·982135	·982181	·982226	45
960	2·982497	2·982543	2·982588	2·982633	2·982678	45
961	·982949	·982994	·983040	·983085	·983130	45
962	·983401	·983446	·983491	·983536	·983581	45
963	·983852	·983897	·983942	·983987	·984032	45
964	·984302	·984347	·984392	·984437	·984482	45
965	·984752	·984797	·984842	·984887	·984932	45
966	·985202	·985247	·985292	·985337	·985382	45
967	2·985651	2·985696	2·985741	2·985786	2·985830	45
968	·986100	·986144	·986189	·986234	·986279	45
969	·986548	·986593	·986637	·986682	·986727	45
970	·986995	·987040	·987085	·987130	·987174	45
971	·987443	·987487	·987532	·987577	·987622	45
972	·987890	·987934	·987979	·988024	·988068	45
973	·988336	·988381	·988425	·988470	·988514	45

Num	0	1	2	3	4	Diff.
974	2.988559	2.988603	2.988648	2.988693	2.988737	45
975	.989005	.989049	.989094	.989138	.989183	45
976	.989450	.989494	.989539	.989583	.989628	44
977	.989895	.989939	.989983	.990028	.990072	44
978	.990339	.990383	.990428	.990472	.990516	44
979	2.990783	2.990827	2.990871	2.990916	2.990960	44
980	.991226	.991270	.991315	.991359	.991403	44
981	.991669	.991713	.991757	.991802	.991846	44
982	.992111	.992156	.992200	.992244	.992288	44
983	992553	.992598	.992642	.992686	.992730	44
984	2.992995	2.993039	2.993083	2.993127	2.993172	44
985	.993436	.993480	.993524	.993568	.993613	44
986	.998877	.993921	.993965	.994009	.994053	44
987	.994367	.994361	.994405	.994449	.994493	44
988	.994757	.994801	.994845	.994889	.994933	44
989	2.995196	2.995240	2.995284	2.995328	2.995372	44
990	.995635	.995679	.995723	.995767	.995811	44
991	.996074	.996117	.996161	.996205	.996249	44
992	.996512	.996555	.996599	.996643	.996687	44
993	.996949	.996993	.997037	.997080	.997124	44
994	2.997386	2.997430	2.997474	2.997517	2.997561	44
995	.997823	.997867	.997910	.997954	.997998	44
996	.998259	.998303	.998346	.998390	.998434	44
997	.998695	.998739	.998782	.998826	.998869	44
998	.999130	.999174	.999218	.999261	.999305	44
999	.999565	.999609	.999652	.999696	.999739	43

Num	5	6	7	8	9	Diff.
974	2.988782	2.988826	2.988871	2.988915	2.988960	45
975	.989227	.989272	.989316	.989361	.989405	45
976	.989672	.989717	.989761	.989806	.989850	44
977	.990117	.990161	.990206	.990250	.990294	44
978	.990561	.990605	.990650	.990694	.990738	44
979	2.991004	2.991049	2.991093	2.991137	2.991182	44
980	.991448	.991492	.991536	.991580	.991625	44
981	.991890	.991934	.991979	.992023	.992067	44
982	.992333	.992377	.992421	.992465	.992509	44
983	.992774	.992818	.992863	.992907	.992951	44
984	2.993216	2.993260	2.993304	2.993348	2.993392	44
985	.993657	.993701	.993745	.993789	.993833	44
986	.994097	.994141	.994185	.994229	.994273	44
987	.994537	.994581	.994625	.994669	.994713	44
988	.994977	.995021	.995064	.995108	.995152	44
989	2.995416	2.995460	2.995504	2.995547	2.995591	44
990	.995854	.995898	.995942	.995986	.996030	44
991	.996293	.996336	.996380	.996424	.996468	44
992	.996730	.996774	.996818	.996862	.996905	44
993	.997168	.997212	.997255	.997299	.997343	44
994	2.997605	2.997648	2.997692	2.997736	2.997779	44
995	.998041	.998085	.998128	.998172	.998216	44
996	.998477	.998521	.998564	.998608	.998652	44
997	.998913	.998956	.999000	.999043	.999087	44
998	.999348	.999392	.999435	.999478	.999522	44
999	.999783	.999826	.999870	.999913	.999957	43

ADVERTISEMENT.

ALL Sorts of Meridian, Azimuths, and Amplitude Compaſſes, Running-glaſſes, Waggoners, Plats, Sea Charts, both Plain and *Mercator*: Likewiſe all ſorts of Mathematical Inſtruments are made and ſold by Wholeſale or Retail, by *Jer. Seller* and *Cha. Price* at the *Hermitage-ſtairs.*

A
TRIANGULAR CANON
Logarithmical:
OR A
TABLE
OF
Artificial SINES, TANGENTS and SECANTS, the Radius 10.000000; and to every Degree and Minute of the QUADRANT.

LONDON,
Printed by *W. Redmayne* for *Jer. Seller*
and *Cha. Price*, 1701.

A Table of Artificial Sines,

0 Degree.

Min.	Sine.		Tang.		Secant.		
0	0 000000	10.000000	0.000000	Infinite.	10.000000	Infinite.	60
1	6.463726	9 999999	6 463726	13.536274	10.000000	13.536274	59
2	6.764756	9.999999	6.764756	13.235244	10.000000	13.235244	58
3	6.940847	9.999999	6.940847	13.059152	10.000000	13.059153	57
4	7.065786	9.999999	7.065786	12.934214	10.000000	12.934214	56
5	7.162696	9.999999	7.162696	12.837304	10.000000	12.837304	55
6	7 241877	9.999999	7.241878	12.758122	10.000001	12.758123	54
7	7.308824	9.999999	7.308825	12.691175	10.000001	12.691176	53
8	7.366816	9 999999	7.366817	12.633183	10.000001	12.633184	52
9	7.417968	9 999998	7.417970	12.582030	10.000001	12.582032	51
10	7.463725	9.999998	7.463727	12.536273	10.000002	12.536274	50
11	7.505118	9.999998	7.505120	12.494880	10.000002	12.494882	49
12	7.542906	9.999997	7.542909	12.457091	10.000003	12.457093	48
13	7.577668	9.999997	7.577671	12 422328	10.000003	12.422332	47
14	7.609853	9.999996	7.609857	12.390143	10 000004	12.390147	46
15	7.639816	9.999996	7.639820	12.360180	10.000004	12.360184	45
16	7.667844	9.999995	7.667849	12.332151	10.000005	12.332155	44
17	7.694173	9.999995	7.694179	12.305821	10.000005	12.305827	43
18	7.718997	9.999994	7.719003	12 280997	10.000006	12.281003	42
19	7.742477	9.999993	7.742484	12.257516	10.000007	12.257522	41
20	7.764254	9.999993	7.764761	12.235239	10.000007	12.235246	40
21	7.785943	9 999992	7 785951	12.214049	10.000008	12.214057	39
22	7.806146	9.999991	7.806155	12.193845	10.000009	12.193854	38
23	7 825451	9.999990	7.825460	12.174540	10.000010	12.174549	37
24	7 843934	9 999989	7.843944	12 156056	10.000011	12.156066	36
25	7 861662	9.999988	7 861674	12.138326	10.000011	12.138338	35
26	7.87869[illegible]	9 999988	7.878708	12.121292	10.000012	12.121305	34
27	7.895085	9.999987	7.895095	12.104901	10 000013	12.104915	33
28	7.910879	9.999986	7 910894	12.089106	10.000014	12.089121	32
29	7.926119	9.999984	7.926134	12.073866	10.000015	12.073881	31
30	7.940842	9 999983	7 940858	12.059162	10.000016	12.059158	30
		Sine.		Tang.		Secant.	Min.

89 Degrees.

Tangents and Secants.

0 *Degree.*

Min.	Sine.		Tang.		Secant.		
30	7.940842	9.999983	7.940858	12.059142	10.000016	12.059158	30
31	7.955082	9.999982	7.955100	12.044900	10.000018	12.044918	29
32	7.968870	9.999981	7.968889	12.031111	10.000019	12.031130	28
33	7.982233	9.999980	7.982253	12.017747	10.000020	12.017767	27
34	7.995198	9.999979	7.995219	12.004781	10.000021	12.004802	26
35	8.007787	9.999977	8.007809	11.992191	10.000022	11.992213	25
36	8.020021	9.999976	8.020044	11.979955	10.000024	11.979979	24
37	8.031919	9.999975	8.031945	11.968055	10.000025	11.968080	23
38	8.043501	9.999973	8.643527	11.956473	10.000026	11.956499	22
39	8.054781	9.999972	8.054809	11.945191	10.000028	11.945219	21
40	8.065776	9.999971	8.065806	11.934194	10.000029	11.934224	20
41	8.076500	9.999969	8.076531	11.923469	10.000031	11.923500	19
42	8.086965	9.999968	8.086997	11.913003	10.000032	11.913035	18
43	8.097183	9.999966	8.097217	11.902783	10.000034	11.902817	17
44	8.107167	9.999964	8.107202	11.892797	10.000036	11.892833	16
45	8.116926	9.999963	8.116963	11.883037	10.000037	11.883074	15
46	8.126471	9.999961	8.126510	11.873490	10.000039	11.873529	14
47	8.135810	9.999959	8.135851	11.864149	10.000041	11.864190	13
48	8.144953	9.999958	8.144996	11.855004	10.000042	11.855047	12
49	8.153907	9.999956	8.153952	11.846048	10.000044	11.846092	11
50	8.162681	9.999954	8.162727	11.837273	10.000046	11.837319	10
51	8.171280	9.999952	8.171328	11.828672	10.000048	11.828720	9
52	8.179713	9.999950	8.179763	11.820237	10.000050	11.820287	8
53	8.187985	9.999948	8.188036	11.811964	10.000052	11.812015	7
54	8.196102	9.999946	8.196156	11.803844	10.000054	11.803898	6
55	8.204070	9.999944	8.204126	11.795874	10.000056	11.795930	5
56	8.211895	9.999942	8.211953	11.788047	10.000058	11.788105	4
57	8.219581	9.999940	8.219641	11.780359	10.000060	11.780419	3
58	8.227133	9.999938	8.227195	11.772805	10.000062	11.772866	2
59	8.234557	9.999936	8.234621	11.765379	10.000064	11.765443	1
60	8.241855	9.999934	8.241921	11.758078	10.000066	11.758145	0
		Sine.		Tang.		Secant.	Min.

89 *Degrees.*

A Table of Artificial Sines,

1 *Degree.*

Min.	Sine.		Tang.		Secant.	
0	8.241855	9.999934	8.241921	11.758078	10.000066	11.758145
1	8.249033	9.999932	8.249101	11.750898	10.000068	11.750967
2	8.256094	9.999929	8.256165	11.743835	10.000071	11.743906
3	8.263042	9.999927	8.263115	11.736885	10.000073	11.730958
4	8.269881	9.999925	8.269956	11.730044	10.000075	11.730119
5	8.276614	9.999922	8.276691	11.723309	10.000078	11.723386
6	8.283243	9.999920	8.283323	11.716677	10.000080	11.716757
7	8.289773	9.999917	8.289856	11.710144	10.000082	11.710227
8	8.296207	9.999915	8.296292	11.703708	10.000085	11.703793
9	8.302546	9.999912	8.302633	11.697366	10.000087	11.697454
10	8.308794	9.999910	8.308884	11.691116	10.000090	11.691206
11	8.314954	9.999907	8.315046	11.684954	10.000093	11.685046
12	8.321027	9.999905	8.321122	11.678878	10.000095	11.678973
13	8.327016	9.999902	8.327114	11.672886	10.000098	11.672984
14	8.332924	9.999899	8.333025	11.666975	10.000101	11.667076
15	8.338753	9.999897	8.338856	11.661144	10.000103	11.661247
16	8.344504	9.999894	8.344612	11.655389	10.000106	11.655496
17	8.350180	9.999891	8.350289	11.649710	10.000109	11.649819
18	8.355783	9.999888	8.355895	11.644105	10.000112	11.644216
19	8.361315	9.999885	8.361430	11.638570	10.000115	11.638685
20	8.366777	9.999882	8.366894	11.633105	10.000118	11.633223
21	8.372171	9.999879	8.372291	11.627708	10.000121	11.627829
22	8.377499	9.999876	8.377622	11.622378	10.000124	11.622501
23	8.382762	9.999873	8.382889	11.617111	10.000127	11.617238
24	8.387962	9.999870	8.388092	11.611908	10.000130	11.612038
25	8.393101	9.999867	8.393234	11.606766	10.000133	11.606899
26	8.398179	9.999864	8.398315	11.601685	10.000136	11.601821
27	8.403194	9.999861	8.403338	11.596662	10.000139	11.596801
28	8.408161	9.999858	8.408304	11.591696	10.000142	11.591839
29	8.413068	9.999854	8.413213	11.586787	10.000146	11.586931
30	8.417919	9.999851	8.418068	11.581932	10.000149	11.582081
		Sine.		Tang.		Secant.

88 *Degrees.*

1 Degree.

Sine.		Tang.		Secant.		
8.417919	9.999851	8.418068	11.581932	10.000149	11.582081	30
8.422717	9 999848	8.422869	11.577131	10.000152	11.577283	29
8.427462	9.999844	8.427618	11.572382	10.000155	11.572538	28
8 432156	9.999841	8.432315	11.567685	10.000159	11.567844	27
8.436800	9.999838	8.436962	11.563038	10.000162	11.563200	26
8.441394	9.999834	8.441560	11.558440	10.000166	11.558606	25
8.445941	9.999831	8.446110	11.553890	10.000169	11.554059	24
8.450440	9.999827	8.450613	11.549387	10.000173	11.549560	23
8.454893	9.999823	8.455070	11.544930	10.000176	11.545107	22
8.459301	9.999820	8.459481	11.540519	10.000180	11.540699	21
8.463664	9.999816	8.463849	11.536151	10.000184	11.536335	20
8.467985	9.999812	8.468172	11.531827	10.000187	11.532015	19
8.472263	9.999809	8.472454	11.527546	10.000191	11.527737	18
8.476498	9.999805	8.476693	11.523307	10.000195	11.523502	17
8 480693	9 999801	8.480892	11.519108	10.000199	11.519307	16
8.484848	9.999797	8.485050	11.514949	10.000203	11.515152	15
8.488963	9.999793	8.489170	11.510830	10.000206	11.511037	14
8.493040	9 999790	8.493250	11.506750	20.000210	11.506960	13
8.497078	9.999786	8.497293	11.502707	10.000214	11.502922	12
8.501080	9.999782	8.501298	11.498702	10 000218	11.498920	11
8.505045	9.999778	8.505267	11.494733	10.000222	11 494955	10
8.508974	9 999774	8.509200	11.490800	10.000226	11.491026	9
8.512867	9.999769	8.513098	11.486902	10.000230	11.487133	8
8.516726	9.999765	8.516961	11.483036	10.000235	11.483274	7
8.520551	9.999761	8.520790	11.479210	10.000239	11.479449	6
8.524343	9.999757	8.524586	11.475414	10.000243	11.475657	5
8.528102	9.999753	8.528349	11.471651	10.000247	11.471898	4
8.531828	9.999748	8.532080	11.467920	10.000252	11.468172	3
8.535523	9.999744	8.535779	11.464221	10.000256	11.464477	2
8.539186	9.999740	8.539447	11.460553	10.000260	11.460814	1
8.542819	9.999735	8.543084	11.4[illegible]6916	10.000265	11.457181	0
	Sine.		Tang.		Secant.	Min.

88 Degrees.

A Table of Artificial Sines,

2 *Degrees.*

Min.	Sine.		Tang.		Secant.	
0	8.542819	9.999735	8.543084	11.456916	10.000265	11.457181
1	8.546422	9.999731	8.546691	11.453309	10.000269	11.453578
2	8.549995	9.999726	8.550268	11.449732	10.000273	11.450005
3	8.553539	9.999722	8.553817	11.446183	10.009278	11.446461
4	8.557054	9.999717	8.557336	11.442664	10.000283	11.442946
5	8.560540	9.999713	8.560828	11.439172	10.000287	11.439460
6	8.563999	9.999708	8.564291	11.435709	10.000292	11.436001
7	8.567431	9.999704	8.567727	11.432272	10.000296	11.432569
8	8.570836	9.999699	8.571137	11.428863	10.000301	11.429164
9	8.574214	9.999694	8.574520	11.425480	10.000306	11.425786
10	8.577566	9.999689	8.577877	11.422123	10.000311	11.422434
11	8.580892	9.999685	8.581208	11.418792	10.000315	11.419108
12	8.584193	9.999680	8.584514	11.415486	10.000320	11.415807
13	8.587469	9.999675	8.587794	11.412206	10.000325	11.412531
14	8.590721	9.999670	8.591051	11.408949	10.000330	11.409279
15	8.593948	9.999665	8.594283	11.405717	10.000335	11.406052
16	8.597152	9.999660	8.597492	11.402508	10.000340	11.402848
17	8.600332	9.999655	8.600677	11.399323	10.000345	11.399668
18	8.603489	9.999650	8.603839	11.396161	10.000350	11.396511
19	8.606623	9.999645	8.606978	11.393022	10.000355	11.393377
20	8.609734	9.999640	8.610094	11.389906	10.000360	11.390266
21	8.612823	9.999635	8.613189	11.386811	10.000365	11.387176
22	8.615891	9.999629	8.616262	11.383738	10.000371	11.384109
23	8.618937	9.999624	8.619313	11.380687	10.000376	11.381063
24	8.621962	9.999619	8.622343	11.377657	10.000381	11.378038
25	8.624965	9.999614	8.625352	11.374648	10.000386	11.375035
26	8.627948	9.999608	8.628340	11.371660	10.000392	11.372052
27	8.630911	9.999603	8.631308	11.368692	10.000397	11.369089
28	8.633854	9.999597	8.634256	11.365744	10.000403	11.366146
29	8.636776	9.999592	8.637184	11.362815	10.000408	11.363224
30	8.639680	9.999586	8.640093	11.359906	10.000413	11.360320
		Sine.		Tang.		Secant.

87 *Degrees.*

Tangents and Secants.

2 *Degrees.*

Min.	Sine.		Tang.		Secant.	
30	8.639680	9.999586	8.640093	11.359907	10.000413	11.360320
31	8.642563	9.999581	8.642982	11.357017	10.000419	11.35743
32	8.645428	9.999575	8.645853	11.354147	10.000425	11.35457
33	8.648274	9.999570	8.648704	11.351296	10.000430	11.351726
34	8.651102	9.999564	8.651537	11.348462	10.000436	11.348898
35	8.653911	9.999558	8.654352	11.345648	10.000442	11.346089
36	8.656702	9.999553	8.657149	11.342851	10.000447	11.343298
37	8.659475	9.999547	8.659928	11.340072	10.000453	11.340525
38	8.662230	9.999541	8.662689	11.337311	10.000459	11.337770
39	8.664968	9.999535	8.665433	11.334567	10.000465	11.335032
40	8.667689	9.999529	8.668160	11.331840	10.000470	11.33231
41	8.670393	9.999524	8.670870	11.329130	10.000476	11.329607
42	8.673080	9.999518	8.673563	11.326437	10.000482	11.326920
43	8.675751	9.999512	8.676239	11.323761	10.000488	11.324249
44	8.678405	9.999506	8.678900	11.321100	10.000494	11.321595
45	8.681043	9.999500	8.681544	11.318456	10.000500	11.318957
46	8.683665	9.999493	8.684172	11.315828	10.000506	11.316335
47	8.686271	9.999487	8.686784	11.313216	10.000513	11.313727
48	8.688863	9.999481	8.689381	11.310619	10.000519	11.311135
49	8.691438	9.999475	8.691693	11.308037	10.000525	11.308562
50	8.693998	9.999469	8.694529	11.305471	10.000531	11.306002
51	8.696543	9.999462	8.697081	11.302919	10.000537	11.303457
52	8.699073	9.999456	8.699617	11.300383	10.000544	11.300927
53	8.701589	9.999450	8.702139	11.297861	10.000550	11.298411
54	8.704090	9.999443	8.704646	11.295353	10.000556	11.295910
55	8.706577	9.999437	8.707139	11.292860	10.000563	11.293423
56	8.709049	9.999431	8.709618	11.290381	10.000569	11.290951
57	8.711507	9.999424	8.712083	11.287917	10.000576	11.288492
58	8.713952	9.999418	8.714534	11.285465	10.000582	11.286048
59	8.716383	9.999411	8.716972	11.283028	10.000589	11.283617
60	8.718800	9.999404	8.719396	11.280604	10.000596	11.281200
		Sine.		Tang.		Secant.

87 *Degrees.*

3 *Degrees.*

Min.	Sine.		Tang.		Secant.		
0	8.718800	9.999404	8.719396	11.280604	10.000596	11.281200	60
1	8.721204	9.999398	8.721806	11.278194	10.000602	11.278796	59
2	8.723595	9.999391	8.724203	11.275796	10.000609	11.276405	58
3	8.725972	9.999384	8.726588	11.273412	10.000616	11.274028	57
4	8.728337	9.999378	8.728959	11.271041	10.000622	11.271663	56
5	8.730688	9.999371	8.731317	11.268683	10.000629	11.269312	55
6	8.733027	9.999364	8.733663	11.266337	10.000636	11.266973	54
7	8.735353	9.999357	8.735996	11.264004	10.000643	11.264646	53
8	8.737667	9.999350	8.738317	11.261683	10.000650	11.262332	52
9	8.739969	9.999343	8.740626	11.259374	10.000657	11.260031	[illegible]
10	8.742259	9.999336	8.742922	11.257078	10.000664	11.257741	50
11	8.744536	9.999329	8.745207	11.254793	10.000671	11.255464	49
12	8.746801	9.999322	8.747479	11.252521	10.000678	11.253198	48
13	8.749055	9.999315	8.749740	11.250260	10.000685	11.250945	47
14	8.751297	9.999308	8.751989	11.248011	10.000692	11.248703	46
15	8.753528	9.999301	8.754227	11.245773	10.000699	11.246472	45
16	8.755747	9.999294	8.756453	11.243547	10.000706	11.244253	44
17	8.757955	9.999286	8.758668	11.241332	10.000713	11.242045	43
18	8.760151	9.999279	8.760872	11.239128	10.000721	11.239845	42
19	8.762337	9.999272	8.763065	11.236935	10.000728	11.237663	41
20	8.764511	9.999265	8.765246	11.234753	10.000735	11.235489	40
21	8.766675	9.999257	8.767417	11.232582	10.000743	11.233325	39
22	8.768827	9.999250	8.769578	11.230422	10.000750	11.231172	38
23	8.770970	9.999242	8.771727	11.228273	20.000758	11.229030	37
24	8.773101	9.999235	8.773866	11.226133	10.000765	11.226899	36
25	8.775223	9.999227	8.775995	11.224005	10.000773	11.224777	35
26	8.777333	9.999220	8.778114	11.221886	10.000780	11.222667	34
27	8.779434	9.999212	8.780222	11.219778	10.000788	11.220566	33
28	8.781524	9.999205	8.782320	11.217680	10.000795	11.218476	32
29	8.783605	9.999197	8.784408	11.215592	10.000803	11.216395	31
30	8.735675	9.999189	8.786486	11.213514	10.000811	11.214325	30
		Sine.		Tang.		Secant.	Min.

86 *Degrees.*

3 *Degrees.*

Min.	Sine.		Tang.		Secant.		
30	8.785675	9.999189	8.786486	11.213514	10.000811	11.214325	30
31	8.787736	9.999181	8.788554	11.211446	10.000818	11.212264	29
32	8.789787	9.999174	8.790613	11.209387	10.000826	11.210213	28
33	8.791828	9.999166	8.792662	11.207338	10.000834	11.208172	27
34	8.793859	9.999158	8.794701	11.205299	10.000842	11.206141	26
35	8.795881	9.999150	8.796732	11.203269	10.000850	11.204119	25
36	8.797894	9.999142	8.798752	11.201248	10.000858	11.202106	24
37	8.799897	9.999134	8.800763	11.199237	10.000866	11.200103	23
38	8.801891	9.999126	8.802765	11.197235	10.000874	11.198108	22
39	8.803876	9.999118	8.804758	11.195242	10.000882	11.196124	21
40	8.805852	9.999110	8.806742	11.193258	10.000890	11.194148	20
41	8.807819	9.999102	8.808717	11.191283	10.000898	11.192181	19
42	8.809777	9.999094	8.810683	11.189317	10.000906	11.190223	18
43	8.811726	9.999086	8.812641	11.187359	10.000914	11.188274	17
44	8.813667	9.999077	8.814589	11.185411	10.000923	11.186333	16
45	8.815598	9.999069	8.816529	11.183471	10.000931	11.184401	15
46	8.817522	9.999061	8.818461	11.181539	10.000939	11.182478	14
47	8.819436	9.999052	8.820384	11.179616	10.000947	11.180564	13
48	8.821342	9.999044	8.822298	11.177702	10.000956	11.178657	12
49	8.823240	9.999036	8.824205	11.175795	10.000964	11.176760	11
50	8.825130	9.999027	8.826103	11.173897	10.000973	11.174870	10
51	8.827011	9.999019	8.827992	11.172008	10.000981	11.172989	9
52	8.828884	9.999010	8.829874	11.170126	10.000990	11.171116	8
53	8.830749	9.999002	8.831748	11.168252	10.000998	11.169250	7
54	8.832607	9.998993	8.833613	11.166387	10.001007	11.167393	6
55	8.834456	9.998984	8.835471	11.164529	10.001015	11.165544	5
56	8.836297	9.998976	8.837321	11.162679	10.001024	11.163703	4
57	8.838130	9.998967	8.839163	11.160837	10.001033	11.161870	3
58	8.839956	9.998958	8.840998	11.159002	10.001042	11.160044	2
59	8.841774	9.998950	8.842824	11.157175	10.001050	11.158226	1
60	8.843584	9.998941	8.844644	11.155356	10.001059	11.156415	0
		Sine.		Tang.		Secant.	Min.

86 *Degrees.*

A Table of Artificial Sines,

4 *Degrees.*

	Sine.		Tang.		Secant.		
0	8.843584	9.998941	8.844644	11.155356	10.001059	11.156415	60
1	8.845387	9.998932	8.846455	11.153545	10.001068	11.154613	59
2	8.847183	9.998923	8.848260	11:151740	10.001077	11.152817	58
3	8.848971	9.998914	8 850056	11.149943	10.001086	11.151029	57
4	8 850751	9.998905	8.851846	11.148154	10.001095	11.149249	56
5	8.852524	9.998896	8 853628	11.146372	10.001104	11.147475	55
6	8.854290	9.998887	8.855403	11.144597	10.001113	11.145709	54
7	8.856049	9.998878	8.857171	11.142829	10.001122	11.143951	53
8	8.857801	9.998869	8.858932	11.141068	10.001131	11.142199	52
9	8 859946	9.998860	8.860686	11.139314	10.001140	11.140554	51
0	8.861283	9.998851	8.862433	11.137567	10.001149	11.138717	50
1	8.863014	9.998841	8.864172	11.135827	10.001159	11.136986	49
2	8.864738	9.998832	8.865905	11.134094	10.001168	11.135262	48
3	8.866454	9 998823	8.867632	11.132368	10.001177	11.133545	47
4	8.868165	9.998813	8.869351	11.130649	10.001186	11.131835	46
5	8.869868	9.998804	8.871064	11.128936	10.001196	11.130132	45
6	8.871565	9.998795	8.872770	11.127230	10.001205	11.128435	44
7	8.873255	9.998785	8.874469	11.125531	10.001215	11.126745	43
8	8.874938	9.998776	8.876162	11.123838	10.001224	11.125062	42
9	8.876615	9.998766	8.877849	11.122151	10.001234	11.123385	41
0	8.878285	9 998757	8.879529	11.120471	10.001243	11.121715	40
1	8.879949	9.998747	8.881202	11.118798	10.001253	11.120051	39
2	8.881607	9.998737	8.882869	11.117131	10.001262	11.118393	38
3	8 883258	9.998728	8 884530	11.115470	10.001272	11.116742	37
4	8.884903	9 998718	8.886185	11.113815	10 001282	11.115097	36
5	8.886542	9.998708	8.887833	11.112167	10.001292	11.113458	35
6	8.888174	9.998699	8.889476	11.110524	10.001301	11.111826	34
7	8.889801	9.998689	8.891112	11.108888	10.001311	11.110199	33
8	8.891421	9.998679	8.892742	11.107258	10.001321	11.108579	32
9	8.893035	9 998669	8.894366	11.105634	10.001331	11.106965	31
0	8.894643	9.998659	8.895984	11.104016	10.001341	11.105357	30
		Sine.		Tang.		Secant.	Min.

85 *Degrees.*

4 *Degrees.*

Min.	Sine.		Tang.		Secant.		
30	8.894643	9.998659	8.895984	11.104016	10.001341	11.105357	30
31	8.896245	9.998649	8.897596	11.102404	10.001351	11.103754	29
32	8.897842	9.998639	8.899203	11.100797	10.001361	11.102158	28
33	8.899432	9.998629	8.900803	11.099197	10.001371	11.100568	27
34	8.901017	9.998619	8.902398	11.097602	10.001381	11.098983	26
35	8.902595	9.998609	8.903987	11.096013	10.001391	11.097404	25
36	8.904168	9.998599	8.905570	11.094430	10.001401	11.095831	24
37	8.905736	9.998589	8.907147	11.092853	10.001411	11.094264	23
38	8.907287	9.998578	8.908719	11.091281	10.001422	11.092702	22
39	8.908853	9.998568	8.910285	11.089715	10.001432	11.091146	21
40	8.910404	9.998558	8.911846	11.088154	10.001442	11.089596	20
41	8.911949	9.998547	8.913401	11.086599	10.001452	11.088051	19
42	8.913488	9.998537	8.914951	11.085049	10.001463	11.086512	18
43	8.915022	9.998527	8.916495	11.083505	10.001473	11.084978	17
44	8.916550	9.998516	8.918034	11.081966	10.001484	11.083450	16
45	8.918073	9.998506	8.919567	11.080432	10.001494	11.081927	15
46	8.919591	9.998495	8.921096	11.078904	10.001505	11.080409	14
47	8.921103	9.998485	8.922619	11.077381	10.001515	11.078897	13
48	8.922610	9.998474	8.924136	11.075864	10.001526	11.077389	12
49	8.924112	9.998464	8.925649	11.074351	10.001536	11.075888	11
50	8.925609	9.998453	8.927156	11.072854	10.001547	11.074391	10
51	8.927100	9.998442	8.928658	11.071342	10.001558	11.072900	9
52	8.928587	9.998431	8.930155	11.069845	10.001568	11.071413	8
53	8.930068	9.998421	8.931647	11.068353	10.001579	11.069932	7
54	8.931544	9.998410	8.933134	11.066866	10.001590	11.068456	6
55	8.933015	9.998399	8.934616	11.065384	10.001601	11.066985	5
56	8.934481	9.998388	8.936093	11.063907	10.001612	11.065519	4
57	8.935942	9.998377	8.937565	11.062435	10.001623	11.064058	3
58	8.937398	9.998366	8.939032	11.060968	10.001634	11.062602	2
59	8.938850	9.998355	8.940494	11.059506	10.001645	11.061150	1
60	8.940296	9.998344	8.941952	11.058048	10.001656	11.059704	0
		Sine.		Tang.		Secant.	Min.

85 *Degrees.*

A Table of Artificial Sines,

5 Degrees.

Min.	Sine.		Tang.		Secant.		
0	8.940296	9.998344	8.941952	11.058048	10.001656	11.059704	60
1	8.941738	9.998333	8.943404	11.056596	10.001667	11.058262	59
2	8.943174	9.998322	8.944852	11.055148	10.001678	11.056826	58
3	8.944606	9.998311	8.946295	11.053705	10.001689	11.055394	57
4	8.946033	9.998300	8.947734	11.052266	10.001700	11.053966	56
5	8.947456	9.998288	8.949168	11.050832	10.001711	11.052544	55
6	8.948874	9.998277	8.950597	11.049403	10.001723	11.051126	54
7	8.950287	9.998266	8.952021	11.047979	10.001734	11.049713	53
8	8.951696	9.998255	8.953441	11.046559	10.001745	11.048304	52
9	8.953100	9.998243	8.954856	11.045144	10.001757	11.046900	51
10	8.954499	9.998232	8.956267	11.043733	10.001768	11.045501	50
11	8.955896	9.998220	8.957673	11.042326	10.001780	11.044106	49
12	8.957284	9.998209	8.959075	11.040925	10.001791	11.042716	48
13	8.958670	9.998197	8.960473	11.039527	10.001803	11.041330	67
14	8.960052	9.998186	8.961886	11.038134	10.001814	11.039948	46
15	8.961429	9.998174	8.963254	11.036745	10.001826	11.038571	45
16	8.962801	9.998163	8.964639	11.035361	10.001837	11.037199	44
17	8.964170	9.998151	8.966019	11.033981	10.001849	11.035830	43
18	8.965534	9.998139	8.967394	11.032606	10.001861	11.084466	42
19	8.966893	9.998127	8.968766	11.031234	10.001872	11.033107	41
20	8.968249	9.998116	8.970133	11.029867	10.001884	11.031751	40
21	8.969600	9.998104	8.971496	11.028504	10.001896	11.030400	39
22	8.970947	9.998092	8.972855	11.027145	10.001908	11.029053	38
23	8.972289	9.998080	8.974209	11.025791	10.001920	11.027710	37
24	8.973628	9.998068	8.975560	11.024440	10.001932	11.026372	36
25	8.974962	9.998056	8.976906	11.023094	10.001944	11.025038	35
26	8.976293	9.998044	8.978248	11.021751	10.001956	11.023707	34
27	8.977619	9.998032	8.979586	11.020413	10.001968	11.022381	33
28	8.978941	9.998020	8.980921	11.019079	10.001980	11.021059	32
29	8.980259	9.998008	8.982251	11.017749	10.001992	11.019741	31
30	8.981573	9.997996	8.983577	11.016423	10.002004	11.018427	30
		Sine.		Tang.		Secant.	Min.

84 Degrees.

Tangents and Secants.

5 *Degrees.*

Min.	Sine.		Tang.		Secant.		
30	8.981573	9.997996	8.983577	11.016423	10.002004	11.018427	30
31	8.982883	9.997984	8.984899	11.015101	10.002016	11.017117	29
32	8.984189	9.997972	8.986217	11.013783	10.002028	11.015811	28
33	8.985491	9.997959	8.987532	11.012468	10.002041	11.014509	27
34	8.986789	9.997947	8.988842	11.011158	10.002053	11.013211	26
35	8.988083	9.997935	8.990149	11.009851	10.002065	11.011917	25
36	8.989374	9.997922	8.991451	11.008549	10.002078	11.010626	24
37	8.990660	9.997910	8.992750	11.007250	10.002090	11.009340	23
38	8.991943	9.997897	8.994045	11.005955	10.002102	11.008057	22
39	8.993222	9.997885	8.995337	11.004663	10.00212	11.006778	21
40	8.994497	9.997872	8.996624	11.003376	10.002127	11.005503	20
41	8.995768	9.997859	8.997908	11.002092	10.002141	11.004232	19
42	8.997036	9.997847	8.999188	11.000812	10.002153	11.002964	18
43	8.998299	9.997835	9.000465	10.999535	10.002165	11.001701	17
44	8.999559	9.997822	9.001737	10.998262	10.002178	11.000440	16
45	9.000816	9.997809	9.003007	10.996993	10.00219	10.999184	15
46	9.002069	9.997797	9.004272	10.995728	10.002203	10.997931	14
47	9.003318	9.997784	9.005534	10.994466	10.002216	10.996682	13
48	9.004563	9.997771	9.006792	10.993208	10.002225	10.995437	12
49	9.005805	9.997758	9.008047	10.991953	10.002242	10.994195	11
50	9.007044	9.997745	9.009298	10.990702	10.002255	10.992956	10
51	9.008278	9.997732	9.010546	10.989454	10.002268	10.991722	9
52	9.009510	9.997719	9.011790	10.988210	10.00228	10.990490	8
53	9.010737	9.997706	9.013031	10.986969	10.002294	10.989263	7
54	9.011962	9.997693	9.014268	10.985732	10.002307	10.988038	6
55	9.013182	9.997680	9.015502	10.984498	10.002320	10.986818	5
56	9.014400	9.997667	9.016732	10.983267	10.002333	10.985600	4
57	9.015613	9.997654	9.017959	10.982041	10.002346	10.984386	3
58	9.016824	9.997641	9.019183	10.980817	10.002359	10.983176	2
59	9.018031	9.997628	9.020400	10.979597	10.002372	10.981969	1
60	9.019230	9.997614	9.021620	10.978380	10.002386	10.980765	0
		Sine.		Tang.		Secant.	Min.

84 *Degrees.*

A Table of Artificial Sines,

6 *Degrees.*

Min.	Sine.		Tang.		Secant.	
0	9.019235	9.997614	9.021620	10.978380	10.002386	10.980765
1	9.020435	9.997601	9.022834	10.977166	10.002399	10 979565
2	9.021632	9.997588	9.024044	10.975956	10.002412	10.978368
3	9.022825	9 997574	9.025251	10 974749	10.002426	10.977175
4	9.024016	9.997561	9.026455	10 973545	10.002439	10.975984
5	9.025203	9 997547	9.027655	10.972345	10.002452	10 974797
6	9.026386	9.997534	9.028852	10.971148	10.002466	10.973613
7	9.027567	9.997520	9.030046	10.969954	10.002479	10 972433
8	9.028744	9.997507	9.031237	10.968763	10.002493	10.971256
9	9.029918	9.997493	9.032425	10.967575	10.002507	10.970082
10	9.031089	9.997480	9.033609	10.966391	10.002520	10.968911
11	9.032257	9.997466	9.03479	10.965209	10 002534	10.967743
12	9.033421	9.997452	9.035969	10.964031	10.002548	10.966579
13	9.034582	9.997439	9.037144	10.962856	10.002561	10.965417
14	9.035741	9.997425	9.038316	10.961684	10.002575	10.964259
15	9.036896	9.997411	9.039485	10.960515	10.002589	10.963104
16	9.038048	9.997397	9 040651	10.959349	10.002603	10.961952
17	9.039197	9.997383	9.041813	10.958187	10.002617	10.960803
18	9.040342	9.997369	9.042973	10 957027	10.002631	10.959658
19	9 041485	9.997355	9.044130	10.955870	10.002645	10.958515
20	9 042625	9.997341	9.045284	10.954716	10.007659	10.957375
21	9.043762	9.997327	9 046434	10.953566	10.002673	10.956238
22	9.044895	9.997313	9.047582	10.952418	10 002687	10.955105
23	9.046026	9.997299	9.048727	10.951273	10.002701	10.953974
24	9.047154	9.997285	9 049869	10.950131	10.002715	10.952846
25	9.048279	9.997271	9.051008	10.948992	10.002729	10.951721
26	9 049400	9.997257	9.052144	10.947856	10.002743	10.950599
27	9.050519	9.997242	9.053277	10.946723	10.002758	10.949481
28	9 051635	9.997228	9.054407	10.945593	10.002772	10.948365
29	9.052748	9.997214	9.055535	10.944465	10.002786	10.947251
30	9.053859	9.997199	9 056659	10 943340	10.002801	10.946141
		Sine.		Tang.		Secant.

83 *Degrees.*

6 Degrees.

Min.	Sine.		Tang.		Secant.		
30	9.053859	9.997199	9.056659	10.943340	10.002801	10.946141	30
31	9.054966	9.997185	9.057781	10.942219	10.002815	10.945034	29
32	9.056071	9.997170	9.058900	10.941100	10.002830	10.943929	28
33	9.057172	9.997156	9.060016	10.939984	10.002844	10.942838	27
34	9.058271	9.997141	9.061130	10.938870	10.002859	10.941729	26
35	9.059367	9.997127	9.062240	10.937760	10.002873	10.940633	25
36	9.060460	9.997112	9.063348	10.936652	10.002888	10.939540	24
37	9.061551	9.997098	9.064453	10.935547	10.002902	10.938449	23
38	9.062639	9.997083	9.065556	10.934444	10.002917	10.937361	22
39	9.063723	9.997068	9.066655	10.933345	10.002932	10.936276	21
40	9.064806	9.997053	9.067752	10.932248	10.002946	10.935194	20
41	9.065885	9.997039	9.068846	10.931153	10.002961	10.934115	19
42	9.066962	9.997024	9.069938	10.930062	10.002976	10.933038	18
43	9.068036	9.997009	9.071027	10.928973	10.002991	10.931964	17
44	9.069107	9.996994	9.072113	10.927887	10.003006	10.930893	16
45	9.070176	9.996979	9.073197	10.926803	10.003021	10.929824	15
46	9.071242	9.996964	9.074278	10.925722	10.003036	10.928758	14
47	9.072305	9.996949	9.075356	10.924644	10.003051	10.927694	13
48	9.073366	9.996934	9.076432	10.923568	10.003066	10.926634	12
49	9.074424	9.996919	9.077505	10.922450	10.003081	10.925576	11
50	9.075480	9.996904	9.078576	10.921424	10.003096	10.924520	10
51	9.076533	9.996889	9.079644	10.920356	10.003111	10.923467	9
52	9.077583	9.996874	9.080710	10.919290	10.003126	10.922417	8
53	9.078631	9.996858	9.081773	10.918227	10.003142	10.921369	7
54	9.079676	9.996843	9.082834	10.917167	10.003157	10.920324	6
55	9.080719	9.996828	9.083891	10.916109	10.003172	10.919281	5
56	9.081759	9.996812	9.084947	10.915053	10.003187	10.918241	4
57	9.082797	9.996797	9.0860 0	10.914000	10.003203	10.9172 3	3
58	9.083832	9.996782	9.087050	10.912950	10.003218	10.916166	2
59	9.084864	9.996766	9.088098	10.911902	10.003234	10.915136	1
60	9.085894	9.996751	9.089144	10.910856	10.003249	10.914105	0
		Sine.		Tang.		Secant.	Min.

83 Degrees.

K

A Table of Artificial Sines,

7 Degrees.

Min.	Sine.		Tang.		Secant.		
0	9.085894	9.996751	9.089144	10.910856	10.003249	10.914105	60
1	9.086922	9.996735	9.090187	10.909813	10.003265	10.913078	59
2	9.087947	9.996720	9.091228	10.908772	10.003280	10.912053	58
3	9.088970	9.996704	9.092266	10.907734	10.003296	10.911030	57
4	9.089990	9.996688	9.093302	10.906698	10.003312	10.910010	56
5	9.091008	9.996673	9.094335	10.905664	10.003327	10.908992	55
6	9.092024	9.996657	9.095367	10.904633	10.003343	10.907976	54
7	9.093037	9.996641	9.096396	10.903604	10.003359	10.906963	53
8	9.094047	9.996625	9.097402	10.902578	10.003375	10.905953	52
9	9.095056	9.996610	9.098446	10.901554	10.003390	10.904944	51
10	9.096061	9.996594	9.099468	10.900532	10.003406	10.903938	50
11	9.097065	9.996578	9.100487	10.899513	10.003422	10.902935	49
12	9.098066	9.996562	9.101504	10.898496	10.003438	10.901934	48
13	9.099065	9.996546	9.102519	10.897481	10.003454	10.900935	47
14	9.100062	9.996530	9.103532	10.896468	10.003470	10.899938	46
15	9.101056	9.996514	9.104542	10.895458	10.003486	10.898944	45
16	9.102048	9.996498	9.105550	10.894450	10.003502	10.897952	44
17	9.103037	9.996482	9.106556	10.893444	10.003518	10.896963	43
18	9.104025	9.996465	9.107559	10.892441	10.003534	10.895975	42
19	9.105010	9.996 49	9.108560	10.891440	10.003551	10.894990	41
20	9.105992	9.996433	9.109559	10.890441	10.003567	10.894008	40
21	9.106973	9.996417	9.110556	10.889444	10.003583	10.893027	39
22	9.107951	9.996400	9.111551	10.888449	10.003600	10.892049	38
23	9.108927	9.996384	9.112543	10.887457	10.003616	10.891073	37
24	9.109901	9.996368	9.113533	10.886467	10.003632	10.890099	36
25	9.110873	9.996351	9.114521	10.885479	10.003649	10.889127	35
26	9.111842	9.996335	9.115507	10.884493	10.003665	10.888158	34
27	9.112809	9.996318	9.116491	10.883509	10.003682	10.887191	33
28	9.113774	9.996302	9.117472	10.882528	10.003698	10.886226	32
29	9.114737	9.996285	9.118452	10.881548	10.003715	10.885263	31
30	9.115698	9.996269	9.119429	10.880571	10.003731	10.884302	30
		Sine.		Tang.		Secant.	Min.

82 ***Degrees.***

7 Degrees.

Min.	Sine.		Tang.		Secant.		
30	9.115698	9.996269	9.119429	10.880571	10.003731	10.884302	30
31	9.116656	9.996252	9.120404	10.879596	10.003748	10.883344	29
32	9.117612	9.996235	9.121377	10.878623	10.003765	10.882387	28
33	9.118567	9.996218	9.122348	10.877652	10.003781	10.881433	27
34	9.119519	9.996202	9.123317	10.876683	10.003798	10.880481	26
35	9.120469	9.996185	9.124284	10.875716	10.003815	10.879531	25
36	9.121417	9.996168	9.125249	10.874751	10.003832	10.878583	24
37	9.122362	9.996151	9.126201	10.873789	10.003849	10.877638	23
38	9.123306	9.996134	9.127172	10.872828	10.003866	10.876694	22
39	9.124248	9.996117	9.128130	10.871870	10.003883	10.875752	21
40	9.125187	9.996100	9.129087	10.870913	10.003900	10.874813	20
41	9.126125	9.996083	9.130041	10.869959	10.003917	10.873875	19
42	9.127069	9.996066	9.130994	10.869006	10.003934	10.872949	18
43	9.127993	9.996049	9.131944	10.868056	10.003951	10.872007	17
44	9.128925	9.996032	9.132893	10.867107	10.003968	10.871075	16
45	9.129854	9.996015	9.133839	10.866161	10.003985	10.870146	15
46	9.130781	9.995998	9.134783	10.865216	10.004002	10.869219	14
47	9.131706	9.995980	9.135726	10.864274	10.004020	10.868294	13
48	9.132630	9.995963	9.136666	10.863333	10.004037	10.867370	12
49	9.133551	9.995946	9.137605	10.862395	10.004054	10.866449	11
50	9.134470	9.995928	9.138542	10.861458	10.004072	10.865530	10
51	9.135387	9.995911	9.139476	10.860524	10.004089	10.864612	9
52	9.136303	9.995894	9.140409	10.859591	10.004106	10.863697	8
53	9.137216	9.995876	9.141340	10.858660	10.004124	10.862784	7
54	9.13812[illegible]	9.995859	9.142269	10.857731	10.004141	10.861872	6
55	9.139037	9.995841	9.143196	10.856804	10.004159	10.860963	5
56	9.139944	9.995823	9.144121	10.855879	10.004176	10.860055	4
57	9.140850	9.995806	9.145044	10.854956	10.004194	10.859150	3
58	9.141754	9.995788	9.145965	10.854034	10.004212	10.858246	2
59	9.142655	9.995770	9.146885	10.853115	10.004229	10.857344	1
60	9.143555	9.995753	9.147802	10.852197	10.004247	10.856445	0
		Sine.		Tang.		Secant.	Min.

82 Degrees.

A Table of Artificial Sines,

8 *Degrees.*

Min.	Sine.		Tang.		Secant.		
0	9.143555	9.995753	9.147802	10.852197	10.004247	10.856445	60
1	9.144453	9.995735	9.148718	10.851282	10.004265	10.855547	59
2	9.145349	9.995717	9.149632	10.850368	10.004283	10.854651	58
3	9.146243	9.995699	9.150544	10.849456	10.004301	10.853756	57
4	9.147136	9.995681	9.151454	10.848546	10.004318	10.852864	56
5	9.148026	9.995663	9.152363	10.847637	10.004336	10.851974	55
6	9.148915	9.995646	9.153269	10.846731	10.004354	10.851085	54
7	9.149801	9.995628	9.154174	10.845826	10.004372	10.850198	53
8	9.150686	9.995609	9.155077	10.844923	10.004390	10.849314	52
9	9.151569	9.995591	9.155978	10.844022	10.004408	10.848431	51
10	9.152451	9.995573	9.156887	10.843123	10.004427	10.847549	50
11	9.153330	9.995555	9.157775	10.842225	10.004445	10.846670	49
12	9.154208	9.995537	9.158671	10.841329	10.004463	10.845792	48
13	9.155083	9.995519	9.159565	10.840435	10.004481	10.844917	47
14	9.155957	9.995500	9.160457	10.839543	10.004499	10.844043	46
15	9.156830	9.995482	9.161347	10.838653	10.004518	10.843170	45
16	9.157700	9.995464	9.162236	10.837764	10.004536	10.842300	44
17	9.158569	9.995445	9.163123	10.836877	10.004554	10.841431	43
18	9.159435	9.995427	9.164008	10.835992	10.004573	10.840565	42
19	9.160300	9.995409	9.164892	10.835108	10.004591	10.839699	41
20	9.161164	9.995390	9.165774	10.834226	10.004610	10.838836	40
21	9.162025	9.995372	9.166654	10.833346	10.004628	10.837974	39
22	9.162885	9.995353	9.167532	10.832468	10.004647	10.837115	38
23	9.163743	9.995334	9.168499	10.831591	10.004665	10.836257	37
24	9.164600	9.995316	9.169284	10.830716	10.004684	10.835400	36
25	9.165454	9.995297	9.170157	10.829843	10.004703	10.834546	35
26	9.166307	9.995278	9.171029	10.828971	10.004721	10.833693	34
27	9.167159	9.995260	9.171899	10.828101	10.004740	10.832841	33
28	9.168008	9.995241	9.172767	10.827233	10.004759	10.831992	32
29	9.168856	9.995222	9.173634	10.826366	10.004778	10.831144	31
30	9.169702	9.995203	9.174499	10.825501	10.004797	10.830298	30
		Sine.		Tang.		Secant.	Min.

81 *Degrees.*

8 *Degrees.*

Min	Sine.		Tang.		Secant.		
0	9.169702	9.995203	9.174499	10.825501	10.004797	10.830298	3
1	9.170546	9.995184	9.175362	10.824638	10.004816	10.829453	2
2	9.171389	9.995165	9.176224	10.823776	10.004835	10.828611	2
3	9.172230	9.995146	9.177084	10.822916	10.004854	10.827769	2
4	9.173070	9.995127	9.177942	10.822057	10.004873	10.826930	2
5	9.173908	9.995108	9.178799	10.821201	10.004892	10.826092	2
6	9.174744	9.995089	9.179655	10.820345	10.004911	10.825256	2
7	9.175578	9.995070	9.180508	10.819492	10.004930	10.824422	2
8	9.176411	9.995051	9.181360	10.818640	10.004949	10.823589	2
9	9.177242	9.995032	9.182211	10.817789	10.004968	10.822757	2
0	9.178072	9.995013	9.183059	10.816940	10.004987	10.821928	2
1	9.178900	9.994993	9.183907	10.816093	10.005007	10.821108	1
2	9.179726	9.994974	9.184752	10.815247	10.005026	10.820273	
3	9.180551	9.994955	9.185597	10.814403	10.005045	10.819489	1
4	9.181374	9.994935	9.186439	10.813561	10.005064	10.818626	1
5	9.182196	9.994916	9.187280	10.812720	10.005084	10.817804	1
6	9.183016	9.994896	9.188120	10.811880	10.005104	10.816984	1
7	9.183834	9.994877	9.188957	10.811042	10.005123	10.816166	1
8	9.184651	9.994857	9.189794	10.810206	10.005143	10.815349	1
9	9.185466	9.994838	9.190629	10.809371	10.005162	10.814533	1
0	9.186280	9.994818	9.191462	10.808538	10.005182	10.813720	
1	9.187092	9.994798	9.192294	10.807706	10.005201	10.812908	
2	9.187903	9.994779	9.193124	10.806876	10.005221	10.812097	
3	9.188712	9.994759	9.193953	10.806047	10.005241	10.811288	
4	9.189519	9.994739	9.194780	10.805220	10.005261	10.810480	
5	9.190325	9.994729	9.195606	10.804394	10.005280	10.809675	
6	9.191130	9.994700	9.196430	10.803570	10.005300	10.808870	
7	9.191933	9.994680	9.197253	10.802747	10.005320	10.808067	
8	9.192734	9.994660	9.198074	10.801926	10.005340	10.807266	
9	9.193534	9.994640	9.198894	10.801106	10.005360	10.806466	
0	9.194332	9.994620	9.199712	10.800287	10.005380	10.805668	
		Sine.		Tang.		Secant.	

81 *Degrees.*

A Table of Artificial Sines,

9 Degrees.

Min.	Sine.		Tang.		Secant.		
0	9.194332	9.994620	9.199712	10.800287	10.005380	10.805668	60
1	9.195129	9.994600	9.200529	10.799471	10.005400	10.804876	59
2	9.195925	9.994580	9.201345	10.798655	10.005420	10.804075	58
3	9.196719	9.994560	9.202159	10.797841	10.005440	10.803281	57
4	9.197511	9.994540	9.202971	10.797029	10.005460	10.802489	56
5	9.198302	9.994519	9.203782	10.796217	10.005481	10.801698	55
6	9.199091	9.994499	9.204592	10.795408	10.005501	10.800909	54
7	9.199879	9.994479	9.205400	10.794600	10.005521	10.800121	53
8	9.200666	9.994459	9.206207	10.793793	10.005541	10.799334	52
9	9.201451	9.994438	9.207013	10.792987	10.005562	10.798549	51
10	9.202234	9.994418	9.207816	10.792183	10.005582	10.797765	50
11	9.203017	9.994397	9.208619	10.791381	10.005602	10.796983	49
12	9.203797	9.994377	9.209420	10.790580	10.005623	10.796203	48
13	9.204577	9.994357	9.210220	10.789780	10.005643	10.795423	47
14	9.205354	9.994336	9.211018	10.788982	10.005664	10.794645	46
15	9.206131	9.994316	9.211815	10.788185	10.005684	10.793869	45
16	9.206906	9.994295	9.212611	10.787389	10.005705	10.793094	44
17	9.207679	9.994274	9.213405	10.786595	10.005723	10.792320	43
18	9.208452	9.994254	9.214198	10.785802	10.005746	10.791548	42
19	9.209222	9.994233	9.214989	10.785011	10.005767	10.790778	41
20	9.209992	9.994212	9.215779	10.784220	10.005788	10.790008	40
21	9.210760	9.994191	9.216568	10.783432	10.005809	10.789240	39
22	9.211526	9.994171	9.217356	10.782644	10.005829	10.788474	38
23	9.212291	9.994150	9.218142	10.781858	10.005850	10.787709	37
24	9.213055	9.994129	9.218926	10.781074	10.005871	10.786945	36
25	9.213818	9.994108	9.219710	10.780290	10.005892	10.786182	35
26	9.214579	9.994087	9.220492	10.779508	10.005913	10.785421	34
27	9.215337	9.994066	9.221272	10.778728	10.005934	10.784662	33
28	9.216097	9.994045	9.222052	10.777948	10.005955	10.783903	32
29	9.216854	9.994024	9.222830	10.777170	10.005976	10.783146	31
30	9.217609	9.994003	9.223606	10.776393	10.005997	10.782391	30
		Sine.		Tang.		Secant.	Min.

80 Degrees.

9 *Degrees.*

	Sine.		Tang.		Secant.	
0	9.217609	9.994003	9.223606	10.776393	10.005997	10.782391
1	9.218363	9 993981	9.224382	10.775618	10.006018	10.781636
2	9.219116	9.993960	9.225156	10.774844	10.006040	10.780884
3	9.219868	9 993939	9.225929	10.774071	10.006061	10.780132
4	9 220618	9.993918	9.226700	10.773300	10.006082	10.779382
5	9.221367	9.993896	9.227471	10.772529	10.006103	10.778633
6	9.222115	9.993875	9.228239	10.771760	10.006125	10.777885
7	9.222861	9.993854	9.229007	10.770993	10.006146	10.777139
8	9.223606	9.993832	9.229773	10 770226	10.006168	10.776394
9	9.224349	9.993811	9.230539	10.769461	10.006189	10.775650
0	9.225092	9.993789	9.231308	10.768698	10.006211	10.774908
1	9.225833	9.993768	9.232065	10.767935	10.006232	10.774167
2	9.226572	9 993746	9.232826	10.767174	10.006254	10.773427
3	9.227311	9.993725	9.233586	10.766414	10.006275	10.772689
4	9.228048	9.993703	9.234345	10.765655	10.006297	10 771952
5	9.228784	9.993681	9.235103	10.764897	10.006319	10.771216
6	9.229518	9.993660	9.235859	10 764141	10.006340	10.770481
7	9.230252	9.993638	9.236614	10 763386	10.006362	10.769748
8	9.230984	9.993616	9.237368	10.762632	10.006384	10.769016
9	9.231714	9 993594	9.238120	10.761880	10.006406	10.768285
0	9.232444	9.993572	9.238872	10.761128	10.006428	10.767556
1	9.233172	9 993550	9.239622	10.760378	10.006450	10.766828
2	9.233899	9.993528	9.240371	10.759629	10.006471	10.766101
3	9 234625	9 993506	9.241118	10.758881	10.006493	10.765375
4	9.235349	9.993484	9.241865	10.758135	10.006516	10.764651
5	9.236073	9.993462	9.242610	10.757390	10.006538	10.763927
6	9 236795	9.993440	9.243354	10.756646	10.006560	10.763206
7	9.237515	9 993418	9.244097	10.755903	10.006582	10.762485
8	9.238235	9 993396	9.244839	10.755161	10.006604	10.761765
9	9.238953	9.993374	9.245579	10.754421	10.006626	10.761047
0	9.239670	9.993351	9.246319	10.753681	10.006648	10.760330
		Sine.		Tang		Secant.

80 *Degrees.*

A Table of Artificial Sines,

10 *Degrees.*

Min.	Sine.		Tang.		Secant.	
0	9.239670	9.993351	9.246319	10.753681	10.006648	10.760330
1	9.240386	9.993329	9.247057	10.752943	10.006671	10.759614
2	9.241101	9.993307	9.247794	10.752206	10.006693	10.758899
3	9.241814	9.993284	9.248530	10.751470	10.006715	10.758186
4	9.242526	9.993262	9.249264	10.750736	10.006738	10.757474
5	9.243237	9.993240	9.249998	10.750002	10.006760	10.756763
6	9.243947	9.993217	9.250730	10.749270	10.006783	10.756053
7	9.244656	9.993195	9.251461	10.748539	10.006805	10.755344
8	9.245363	9.993172	9.752191	10.747809	10.006828	10.754637
9	9.246069	9.993149	9.252920	10.747080	10.006851	10.753930
10	9.246775	9.993127	9.253648	10.746352	10.006873	10.753225
11	9.247478	9.993104	9.254374	10.745626	10.006895	10.752522
12	9.248181	9.993081	9.255100	10.744900	10.006919	10.751819
13	9.248883	9.993059	9.255824	10.744176	10.006941	10.751117
14	9.249583	9.993036	9.256547	10.743453	10.006964	10.750417
15	9.250282	9.993013	9.257269	10.742731	10.006987	10.749718
16	9.250980	9.992990	9.257990	10.742010	10.007010	10.749020
17	9.251677	9.992967	9.258710	10.741290	10.007033	10.748323
18	9.252373	9.992944	9.259428	10.740571	10.007056	10.747627
19	9.253067	9.992921	9.260146	10.739854	10.007079	10.746932
20	9.253761	9.992898	9.260862	10.739137	10.007102	10.746239
21	9.254453	9.992875	9.261578	10.738422	10.007125	10.745547
22	9.255144	9.992852	9.262292	10.737708	10.007148	10.744856
23	9.255834	9.992829	9.263005	10.736995	10.007171	10.744166
24	9.256523	9.992806	9.263717	10.736283	10.007194	10.743477
25	9.257211	9.992783	9.264428	10.735572	10.007217	10.742785
26	9.257898	9.992759	9.265138	10.734862	10.007240	10.742102
27	9.258583	9.992736	9.265847	10.734153	10.007264	10.741417
28	9.259268	9.992713	9.266555	10.733445	10.007287	10.740732
29	9.25995[illegible]	9.992689	9.267261	10.732739	10.007310	10.740049
30	9.26063[illegible]	9.992666	9.267967	10.732033	10.007334	10.739367
		Sine.		Tang.		Secant.

79 *Degrees.*

10 *Degrees.*

Min.	Sine.		Tang.		Secant.		
30	9.260633	9.992666	9.267967	10.732033	10.007334	10.739367	3
31	9.261314	9.992643	9.268671	10.731329	10 007357	10.738686	2
32	9.261994	9.992619	9.269375	10.730625	10.007381	10.738006	2
33	9.262673	9.992596	9.270077	10.729923	10.007404	10.737327	2
34	9.263351	9.992572	9.270779	10.729221	10.007428	10.736649	2
35	9.264027	9.992549	9.271479	10.728521	10.007451	10.735973	2
36	9.264703	9.992525	9 272178	10.727822	10.007475	10.735297	24
37	9.265377	9.992501	9.272876	10.727124	10.007499	10.734622	2
38	9.266051	9.992478	9.273573	10.726427	10.007522	10.733949	2
39	9.266723	9.992454	9.274269	10.725731	10.007546	10.733277	21
40	9.267394	9.992430	9.274964	10.725036	10.007570	10.732605	2
41	9.268065	9.992406	9 275658	10.724342	10.007594	10.731935	19
42	9.268734	9.992382	9.276351	10.723649	10.007618	10.731266	18
43	9 269402	9.992358	9.277043	10.722957	10.007641	10.730598	17
44	9.270069	9.992335	9.277734	10.722266	10.007665	10.729931	16
45	9.270735	9.992311	9.278424	10.721576	10.007689	10.729265	15
46	9.271400	9.992287	9.279113	10.720887	10.007713	10.728600	14
47	9.272063	9.992263	9.279801	10.720199	10.007737	10.727936	13
48	9.272726	9.992238	9.280488	10.719512	10.007761	10.727274	12
49	9.273388	9.992214	9.281174	10.718826	10.007786	10.726612	11
50	9.274049	9.992190	9.281858	10.718141	10.007810	10.725951	1
51	9.274708	9.992166	9.282542	10.717458	10.007834	10.725292	9
52	9.275367	9.992142	9.283225	10.716775	10.007858	10.724633	8
53	9.276024	9.992117	9.283907	10.716093	10.007882	10.723975	7
54	9.276681	9.992093	9.284588	10 715412	10.007907	10.723319	6
55	9.277337	9.992069	9.285268	10.714732	10.007931	10.722663	5
56	9.277991	9 992044	9.285947	10.714053	10.007955	10.722009	4
57	9.278644	9.992020	9.286624	10.713375	10.007980	10.721355	3
58	9.279297	9.991996	9 287301	10.712699	10.008004	10.720703	2
59	9.279948	9.991971	9.287977	10.712023	10.008029	10.720052	1
60	9.280599	9.991947	9.288652	10.711348	10.008053	10.719401	0
		Sine.		Tang.		Secant.	Min.

79 *Degrees.*

A Table of Artificial Sines,

11 *Degrees.*

Min.	Sine.		Tang.		Secant.		
0	9.280599	9.991947	9.288652	10.711348	10.008053	10.719401	60
1	9.281248	9.991922	9.289236	10.710674	10.008078	10.718752	59
2	9.281897	9.991897	9.289999	10.710001	10.008103	10.718103	58
3	9.282544	9.991873	9.290671	10.709329	10.008127	10.717456	57
4	9.283190	9.991848	9.291342	10.708658	10.008152	10.716809	56
5	9.283836	9.991823	9.292013	10.707987	10.008177	10.716164	55
6	9.284480	9.991799	9.292682	10.707318	10.008201	10.715520	54
7	9.285124	9.991774	9.293350	10.706650	10.008226	10.714876	53
8	9.285766	9.991749	9.294017	10.705983	10.008251	10.714234	52
9	9.286408	9.991724	9.294684	10.705316	10.008276	10.713592	51
10	9.287048	9.991699	9.295349	10.704651	10.008301	10.712952	50
11	9.287687	9.991674	9.296013	10.703987	10.008326	10.712312	49
12	9.288326	9.991649	9.296677	10.703323	10.008351	10.711674	48
13	9.288964	9.991624	9.297339	10.702660	10.008376	10.711036	47
14	9.289600	9.991599	9.298001	10.701999	10.008401	10.710400	46
15	9.290236	9.991574	9.298662	10.701338	10.008426	10.709764	45
16	9.290870	9.991549	9.299322	10.700678	10.008451	10.709130	44
17	9.291504	9.991524	9.299980	10.700020	10.008476	10.708496	43
18	9.292137	9.991498	9.300638	10.699362	10.008502	10.707863	42
19	9.292768	9.991473	9.301295	10.698705	10.008527	10.707231	41
20	9.293399	9.991448	9.301951	10.698049	10.008552	10.706601	40
21	9.294029	9.991422	9.302607	10.697393	10.008577	10.705971	39
22	9.294658	9.991397	9.303261	10.696739	10.008603	10.705342	38
23	9.295286	9.991372	9.303914	10.696086	10.008628	10.704714	37
24	9.295913	9.991346	9.304567	10.695433	10.008654	10.704087	36
25	9.296539	9.991321	9.305218	10.694782	10.008679	10.703461	35
26	9.297164	9.991295	9.305869	10.694131	10.008705	10.702836	34
27	9.297788	9.991270	9.306519	10.693481	10.008730	10.702212	33
28	9.298412	9.991244	9.307167	10.692832	10.008756	10.701588	32
29	9.299034	9.991218	9.307815	10.692184	10.008782	10.700966	31
30	9.299655	9.991193	9.308463	10.691537	10.008807	10.700345	30
		Sine.		Tang.		Secant.	Min.

78 *Degrees.*

Tangents and Secants.

11 *Degrees.*

Min.	Sine.		Tang.		Secant.		
30	9.299655	9.991193	9.308463	10.691537	10.008807	10.700345	30
31	9.300276	9.991167	9.309109	10.690891	10.008833	10.699724	29
32	9.300895	9.991141	9.309754	10.690246	10.008859	10.699105	28
33	9.301514	9.991115	9.310398	10.689601	10.008885	10.698486	27
34	9.302132	9.991090	9.311042	10.688958	10.008910	10.697868	2
35	9.302748	9.991064	9.311685	10.688315	10.008936	10.697251	25
36	9.303364	9.991038	9.312327	10.687673	10.008962	10.696636	24
37	9.303979	9.991012	9.312967	10.687032	10.008988	10.696021	23
38	9.304593	9.990986	9.313608	10.686392	10.009014	10.695407	22
39	9.305207	9.990960	9.314247	10.685753	10.009041	10.694793	2
40	9.305819	9.990934	9.314885	10.685115	10.009066	10.694181	20
41	9.306430	9.990908	9.315523	10.684477	10.009092	10.693570	19
42	9.307041	9.990881	9.316159	10.683841	10.009118	10.692959	1
43	9.307650	9.990855	9.316795	10.683205	10.009145	10.692350	17
44	9.308259	9.990829	9.317430	10.682570	10.009171	10.691741	1
45	9.308867	9.990803	9.318064	10.681936	10.009197	10.691133	1
46	9.309474	9.990777	9.318697	10.681303	10.009223	10.690526	1
47	9.310080	9.990750	9.319329	10.680670	10.009250	10.689920	1
48	9.310685	9.990724	9.319961	10.680039	10.009276	10.689315	1
49	9.311289	9.990697	9.320592	10.679408	10.009303	10.688711	1
50	9.311893	9.990671	9.321222	10.678778	10.009329	10.688107	1
51	9.312495	9.990644	9.321851	10.678149	10.009355	10.687505	
52	9.313097	9.990618	9.322479	10.677521	10.009382	10.686903	
53	9.313698	9.990591	9.323106	10.676894	10.009409	10.686302	
54	9.314297	9.990565	9.323733	10.676267	10.009435	10.685702	
55	9.314896	9.990538	9.324358	10.675642	10.009462	10.685103	
56	9.315495	9.990511	9.324983	10.675017	10.009488	10.684505	
57	9.316092	9.990485	9.325607	10.674393	10.009515	10.683908	
58	9.316688	9.990458	9.326230	10.673769	10.009542	10.683311	
59	9.317284	9.990431	9.326853	10.673147	10.009569	10.682716	
60	9.317879	9.990404	9.327474	10.672525	10.009596	10.682121	
		Sine.		Tang.		Secant.	

78 *Degrees.*

A Table of Artificial Sines,

12 *Degrees.*

Sine.		Tang.		Secant.		
9.317879	9.990464	9.327474	10.672525	10.009596	10.682121	60
9.318473	9.990377	9.328095	10.671905	10.009622	10.681527	59
9.319066	9.990351	9.328715	10.671285	10.009649	10.680934	58
9.319658	9.990324	9.329334	10.670665	10.009676	10.680342	57
9.320249	9.990297	9.329953	10.670047	10.009703	10.679750	56
9.320840	9.990270	9.330570	10.669943	10.009730	10.679160	55
9.321430	9.990243	9.331187	10.668813	10.009757	10.678570	54
9.322019	9.990215	9.331803	10.668197	10.009784	10.677981	53
9.322607	9.990188	9.332418	10.667582	10.009812	10.677393	52
9.323194	9.990161	9.333033	10.666967	10.009839	10.676806	51
9.323780	9.990134	9.333646	10.666354	10.009866	10.676220	50
9.324366	9.990107	9.334259	10.665741	10.009893	10.675634	49
9.324950	9.990079	9.334871	10.665129	10.009921	10.675049	48
9.325534	9.990052	9.335482	10.664518	10.009948	10.674466	47
9.326117	9.990025	9.336093	10.663907	10.009975	10.673883	46
9.326700	9.989997	9.336702	10.663297	10.010003	10.673300	45
9.327281	9.989970	9.337311	10.662689	10.010030	10.672719	44
9.327862	9.989942	9.337919	10.662081	10.010058	10.672138	43
9.328442	9.989915	9.338527	10.661473	10.010085	10.671558	42
9.329021	9.989887	9.339133	10.660867	10.010113	10.670979	41
9.329599	9.989860	9.339739	10.660261	10.010140	10.670401	40
9.330176	9.989832	9.340344	10.659656	10.010169	10.669824	39
9.330753	9.989804	9.340948	10.659052	10.010196	10.669247	38
9.331328	9.989777	9.341552	10.658448	10.010223	10.668671	37
9.331903	9.989749	9.342155	10.657845	10.010251	10.668096	36
9.332478	9.989721	9.342757	10.657243	10.010279	10.667522	35
9.333051	9.989693	9.343358	10.656642	10.010307	10.666949	34
9.333624	9.989665	9.343958	10.656042	10.010335	10.666376	33
9.334195	9.989637	9.344558	10.655442	10.010363	10.665804	32
9.334766	9.989609	9.345157	10.654843	10.010390	10.665233	31
9.335337	9.989581	9.345755	10.654245	10.010418	10.664663	30
	Sine.		Tang.		Secant.	Min.

77 *Degrees.*

12 *Degrees.*

Sine.		Tang.		Secant.	
9.335337	9.989581	9.345755	10.654245	10.010418	10.664663
9.335906	9.989553	9.346353	10.653647	10.010446	10.664094
9.336475	9.989525	9.346949	10.653051	10.010475	10.663525
9.337043	9.989497	9.347545	10.652455	10.010503	10.662957
9.337610	9.989469	9.348141	10.651859	10.010531	10.662390
9.338176	9.989441	9.348735	10.651265	10.010559	10.661827
9.338742	9.989413	9.349329	10.650671	10.010587	10.661258
9.339306	9.989384	9.349922	10.650078	10.010615	10.660693
9.339871	9 989356	9.350514	10.649486	10.010644	10.660129
9.340434	9.989328	9.351106	10 648894	10.010672	10.659566
9.340996	9.989299	9.351697	10.648303	10.010700	10.659004
9.341558	9.989271	9.352287	10.647713	10.010729	10.658442
9.342119	9.989243	9.352876	10.647124	10.010757	10.657881
9.342679	9.989214	9.353465	10.646535	10.010786	10.657321
9.343239	9.989186	9.354053	10.645947	10.010814	10.656761
9.343797	9.989157	9.354640	10.645360	10.010843	10.656203
9.344355	9.989128	9.355227	10.644777	10.010872	10.655645
9.344912	9.989100	9.355813	10.644187	10.010900	10.655088
9.345469	9.989071	9.356398	10.643602	10.010929	10.654531
9.346024	9 989042	9.356982	10.643018	10 010958	10.653975
9.346579	9.989014	9.357566	10.642434	10.010986	10.653421
9.347134	9.988985	9.358149	10 641851	10.011015	10.652866
9.347687	9.988956	9.358731	10.641269	10.011044	10.652313
9.348240	9.988927	9.359313	10.640687	10.011073	10.651760
9.348792	9 988898	9.359893	10.640106	10.011102	10.651208
9.349343	9.988869	9.360474	10.639526	10.011131	10.650656
9 349893	9.988840	9.361053	10.638947	10.011160	10.650107
9.350443	9 988811	9.361632	10.638368	10.011189	10.649557
9.350992	9.988782	9.362210	10.637790	10.011218	10.649008
9.351540	9.988753	9.362787	10.637213	10.011247	10.648459
9.352088	9.988724	9.363364	10.636636	10.011276	10.647912
	Sine.		Tang.		Secant.

77 *Degrees.*

A Table of Artificial Sines,

13 *Degrees.*

Min.	Sine.		Tang.		Secant.		
0	9.352088	9.988724	9.363364	10.636636	10.011276	10.647912	60
1	9.352635	9.988685	9.363940	10.636060	10.011305	10.647365	59
2	9.353181	9.988665	9.364515	10.635484	10.011334	10.646819	58
3	9.353726	9.988636	9.365090	10.634910	10.011364	10.646274	57
4	9.354271	9.988607	9.365664	10.634336	10.011393	10.645729	56
5	9.354815	9.988578	9.366237	10.633763	10.011422	10.645185	55
6	9.355358	9.988548	9.366810	10.633190	10.011452	10.644642	54
7	9.355901	9.988519	9.367382	10.632618	10.011481	10.644099	5
8	9.356443	9.988489	9.367953	10.632047	10.011511	10.643557	5
9	9.356984	9.988460	9.368524	10.631476	10.011540	10.643016	5
10	9.357524	9.988430	9.369094	10.630908	10.011570	10.642476	5
11	9.358064	9.988401	9.369663	10.630337	10.011599	10.641936	49
12	9.358603	9.988371	9.370231	10.629768	10.011629	10.641397	4
13	9.359141	9.988341	9.370799	10.629201	10.011658	10.640859	4
14	9.359678	9.988312	9.371367	10.628633	10.011688	10.640321	4
15	9.360215	9.988282	9.371933	10.628067	10.011718	10.639785	4
16	9.360751	9.988252	9.372499	10.627501	10.011748	10.639248	4
17	9.361287	9.988222	9.373064	10.626935	10.011777	10.638713	4
18	9.361822	9.988193	9.373629	10.626371	10.011807	10.638178	4
19	9.362356	9.988163	9.374193	10.625807	10.011837	10.637644	4
20	9.362889	9.988133	9.374756	10.625244	10.011867	10.637111	4
21	9.363422	9.988103	9.375319	10.624681	10.011897	16.636578	3
22	9.363954	9.988073	9.375881	10.624119	10.011927	10.636046	3
23	9.364485	9.988043	9.376442	10.623558	10.011957	10.635515	
24	9.365016	9.988013	9.377003	10.622997	10.011987	10.634984	
25	9.365546	9.987983	9.377563	10.622437	10.012017	10.634454	
26	9.366075	9.987952	9.378122	10.621877	10.012047	10.633925	
27	9.366604	9.987922	9.378681	10.621319	10.012078	10.633396	
28	9.367131	9.987892	9.379239	10.620761	10.012108	10.632868	
29	9.367659	9.987862	9.379797	10.620203	10.012138	10.632341	
30	9.368185	9.987831	9.380354	10.619646	10.012168	10.631815	
		Sine.		Tang.		Secant.	

76 *Degrees.*

13 *Degrees.*

Min.	Sine.		Tang.		Secant.		
30	9.368185	9.987831	9.380354	10.619646	10.012168	10.631815	30
31	9.368711	9 987801	9.380910	10.619090	10.012199	10.631289	29
32	9.369236	9.987771	9.381465	10.618534	10.012229	10.630764	28
33	9.369761	9.987740	9.382020	10.617979	10.012260	10.630239	27
34	9.370285	9.987710	9.382575	10.617425	10.012290	10.629715	26
35	9.370808	9.987679	9.383128	10.616871	10 012321	10.629192	25
36	9.371330	9.987649	9.383682	10.616318	10.012351	16.628670	24
37	9.371852	9.987618	9.384234	10.615766	10.012382	10.628148	23
38	9.372373	9.987588	9.384786	10.615214	10 012412	10.627626	22
39	9 372894	9.987557	9.385337	10.614663	10.012443	10.627106	21
40	9.373414	9.987526	9.385888	10.614112	10.012474	10.626586	20
41	9.373933	9.987495	9.386438	10.613562	10.012504	10.626067	19
42	9.374452	9.987465	9 386987	10.613013	10.012535	10.625548	18
43	9.374970	9.987434	9.387536	10.612464	10 012566	10.625030	17
44	9.375487	9 987403	9.388084	10.611916	16.012597	10.624513	16
45	9.376003	9.987372	9.388631	10.611369	10 012628	10.623997	15
46	9.376519	9 987341	9.389178	10.610822	10.012659	10.623481	14
47	9.377035	9.987310	9.389724	10.610276	10.012690	10.622965	13
48	9.377549	9.987279	9.390270	10.609730	10.012721	10.622451	12
49	9.378063	9.987248	9.390815	10.609185	10.012752	10.621937	11
50	9.378577	9.987217	9.391359	10.608640	10.012783	10.621423	10
51	9.379089	9.987186	9.391903	10.608097	10.012814	10.620911	9
52	9.379601	9.987155	9.392447	10.607553	10.012845	10.620398	8
53	9.380113	9.987124	9.392989	10.607011	10.012876	10.619887	7
54	9.380624	9.987092	9.393531	10.606449	10.012908	10.619376	6
55	9.381134	9.987061	9.394073	10.605927	10.012939	10.618866	5
56	9.381643	9.987030	9.394614	10.605386	10.012970	10.618357	4
57	9.382162	9.986998	9.395154	10.604846	10.013002	10.617848	3
58	9 382660	9.986967	9.395693	10.604306	10.013033	10.617339	2
59	9.383168	9.986936	9.396233	10.603767	10.013064	10.616832	1
60	9.383675	9.986904	9.396771	10.603229	10.013096	10.616325	0
		Sine.		Tang.	\	Secant.	Min.

76 *Degrees.*

A Table of Artificial Sines,

14 *Degrees.*

Min.	Sine.		Tang.		Secant.		
0	9.383675	9.986904	9.396771	10.603229	10.013096	10.616325	60
1	9.384181	9.986873	9.397309	10.602691	10.013127	10.615818	59
2	9.384687	9.986841	9.397846	10.602154	10.013159	10.615313	58
3	9.385192	9.986809	9.398383	10.601617	10.013191	10.614808	57
4	9.385697	9.986778	9.398919	10.601081	10.013222	10.614303	56
5	9.386201	9.986746	9.399455	10.600545	10.013254	10.613799	55
6	9.386704	9.986714	9.399990	10.600010	10.013286	10.613296	54
7	9.387207	9.986683	9.400524	10.599476	10.013317	10.612793	53
8	9.387709	9.986651	9.401058	10.598942	10.013349	10.612291	52
9	9.388210	9.986619	9.401591	10.598409	10.013381	10.611790	51
10	9.388711	9.986587	9.402124	10.597876	10.013413	10.611289	50
11	9.389211	9.986555	9.402656	10.597344	10.013445	10.610789	49
12	9.389711	9.986523	9.403187	10.596813	10.013477	10.610289	48
13	9.390210	9.986491	9.403718	10.596282	10.033509	10.609790	47
14	9.390708	9.986459	9.404249	10.595751	10.013541	10.609292	46
15	9.391206	9.986427	9.404778	10.595222	10.013573	10.608794	45
16	9.391703	9.986395	9.405308	10.594692	10.013605	10.608297	44
17	9.392199	9.986363	9.405836	10.594164	10.013637	10.607801	43
18	9.392695	9.986331	9.406364	10.593636	10.013669	10.607305	42
19	9.393190	9.986299	9.406892	10.593108	10.013701	10.606809	41
20	9.393685	9.986266	9.407419	10.592581	10.013734	10.606315	40
21	9.394179	9.986234	9.407945	10.592055	10.013766	10.605821	39
22	9.394673	9.986202	9.408471	10.591529	10.013798	10.605327	38
23	9.395166	9.986169	9.408996	10.591003	10.013831	10.604834	37
24	9.395658	9.986137	9.409521	10.590479	10.013863	10.604342	36
25	9.396150	9.986104	9.410045	10.589955	10.013895	10.603850	35
26	9.396641	9.986072	9.410569	10.589431	10.013928	10.603359	34
27	9.397131	9.986039	9.411092	10.588908	10.013961	10.602868	33
28	9.397621	9.986007	9.411615	10.588385	10.013993	10.602378	32
29	9.398111	9.985974	9.412137	10.587863	10.014026	10.601889	31
30	9.398600	9.985942	9.412658	10.587342	10.014058	10.601400	30
		Sine.		Tang.		Secant.	Min.

75 *Degrees.*

Tangents and Secants.

14 Degrees.

Min.	Sine.		Tang.		Secant.		
30	9.398600	9.985942	9.412658	10.587342	10.014058	10.601400	3
31	9.399088	9.985909	9.413179	10.586821	10.014091	10.600912	2
32	9.399575	9.985876	9.413699	10.586301	10.014124	10.600425	2
33	9.400062	9.985843	9.414219	10.585781	10.014157	10.599937	2
34	9.400549	9.985811	9.414738	10.585262	10.014189	10.599451	2
35	9.401035	9.985778	9.415257	10.584743	10.014222	10.598965	2
36	9.401520	9.985745	9.415775	10.584225	10.014255	10.598480	2
37	9.402005	9.985712	9.416293	10.583707	10.014288	10.597995	2
38	9.402489	9.985679	9.416810	10.583190	10.014321	10.597511	2
39	9.402973	9.985646	9.417326	10.582673	10.014354	10.597028	2
40	9.403455	9.985613	9.417842	10.582157	10.014387	10.596545	2
41	9.403938	9.985580	9.418358	10.581642	10.014420	10.596062	1
42	9.404420	9.985547	9.418873	10.581127	10.014453	10.595580	1
43	9.404901	9.985513	9.419387	10.580613	10.014486	10.595099	1
44	9.405382	9.985480	9.419901	10.580099	10.014520	10.594618	1
45	9.405862	9.985447	9.420415	10.579585	10.014553	10.594138	1
46	9.406341	9.985414	9.420927	10.579072	10.014586	10.593659	1
47	9.406820	9.985380	9.421440	10.578560	10.014619	10.593180	1
48	9.407299	9.985347	9.421951	10.578048	10.014653	10.592701	1
49	9.407777	9.985314	9.422463	10.577537	10.014686	10.592223	1
50	9.408254	9.985280	9.422973	10.577026	10.014720	10.591746	1
51	9.408731	9.985247	9.423484	10.576516	10.014753	10.591269	9
52	9.409207	9.985213	9.423993	10.576006	10.014787	10.590793	8
53	9.409682	9.985180	9.424503	10.575497	10.014820	10.590318	7
54	9.410157	9.985146	9.425011	10.574989	10.014854	10.589842	6
55	9.410632	9.985112	9.425519	10.574481	10.014887	10.589368	5
56	9.411106	9.985079	9.426027	10.573973	10.014921	10.588894	4
57	9.411579	9.985045	9.426534	10.573466	10.014955	10.588421	3
58	9.412052	9.985011	9.427041	10.572959	10.014989	10.587948	2
59	9.412524	9.984978	9.427547	10.572453	10.015022	10.587475	1
60	9.412996	9.984944	9.428052	10.571947	10.015056	10.587004	0
		Sine.		Tang.		Secant.	Min.

75 Degrees.

M

A Table of Artificial Sines,

15 *Degrees.*

	Sine.		Tang.		Secant.		
0	9.412996	9.984944	9.428052	10.571947	10.015056	10.587004	60
1	9.413467	9.984910	9.428557	10.571442	10.015090	10.586533	59
2	9.413938	9.984876	9.429062	10.570938	10.015124	10.586062	58
3	9.414408	9.984842	9.429566	10.570434	10.015158	10.585592	57
4	9.414878	9.984808	9.430070	10.569930	10.015192	10.585122	56
5	9.415347	9.984774	9.430573	10.569427	10.015226	10.584653	55
6	9.415815	9.984740	9.431075	10.568925	10.015260	10.584185	54
7	9.416283	9.984706	9.431577	10.568423	10.015294	10.583717	53
8	9.416751	9.984672	9.432079	10.567921	10.015328	10.583249	52
9	9.417217	9.984637	9.432580	10.567420	10.015362	10.582783	51
0	9.417684	9.984603	9.433080	10.566920	10.015397	10.582316	50
1	9.418149	9.984569	9.433580	10.566419	10.015431	10.581850	49
2	9.418615	9.984535	9.434080	10.565920	10.015465	10.581385	48
3	9.419079	9.984500	9.434579	10.565421	10.015500	10.580920	47
4	9.419544	9.984466	9.435078	10.564922	10.015534	10.580456	46
5	9.420007	9.984432	9.435576	10.564424	10.015568	10.579993	45
6	9.420470	9.984397	9.436073	10.563927	10.015603	10.579530	44
7	9.420933	9.984363	9.436570	10.563430	10.015637	10.579067	43
8	9.421395	9.984328	9.437067	10.562933	10.015672	10.578605	42
9	9.421857	9.984293	9.437563	10.562437	10.015706	10.578143	41
0	9.422318	9.984259	9.438059	10.561941	10.015741	10.577682	40
1	9.422778	9.984224	9.438554	10.561446	10.015776	10.577222	39
2	9.423238	9.984189	9.439048	10.560951	10.015810	10.576762	38
3	9.423697	9.984155	9.439543	10.560457	10.015845	10.576103	37
4	9.424156	9.984120	9.440036	10.559964	10.015880	10.575844	36
5	9.424615	9.984085	9.440529	10.559470	10.015915	10.575385	35
6	9.425073	9.984050	9.441022	10.558978	10.015950	10.574927	34
7	9.425530	9.984015	9.441514	10.558485	10.015985	10.574470	33
8	9.425987	9.983980	9.442006	10.557994	10.016019	10.574013	32
9	9.426443	9.983945	9.442497	10.557502	10.016054	10.573557	31
0	9.426899	9.983910	9.442988	10.557012	10.016089	10.573101	30
		Sine.		Tang.		Secant.	Min.

74 *Degrees.*

15 *Degrees.*

Min.	Sine.		Tang.		Secant.	
30	9.426899	9.983910	9.442988	10.557012	10.016089	10.57310
31	9.427354	9.983875	9.443479	10.556521	10.016124	10.57264
32	9.427809	9.983840	9.443968	10.556031	10.016160	10.57219
33	9.428263	9.983805	9.444458	10.555542	10.016195	10.57173
34	9.428717	9.983770	9.444947	10.555053	10.016230	10.57128
35	9.429170	9.983735	9.445435	10.554565	10.016265	10.57083
36	9.429623	9.983700	9.445923	10.554077	10.016300	10.57037
37	9.430075	9.983664	9.446411	10.553589	10.016336	10.56992
38	9.430527	9.983629	9.446898	10.553102	10.016371	10.56947
39	9.430978	9.983594	9.447384	10.552616	10.016406	10.56902
40	9.431429	9.983558	9.447870	10.552130	10.016442	10.56857
41	9.431879	9.983523	9.448356	10.551644	10.016477	10.56812
42	9.432328	9.983487	9.448841	10.551159	10.016513	10.56767
43	9.432778	9.983452	9.449326	10.550674	10.016548	10.56722
44	9.433226	9.983416	9.449810	10.550190	10.016584	10.56677
45	9.433675	9.983380	9.450294	10.549706	10.016619	10.56632
46	9.434122	9.983345	9.450777	10.549223	10.016655	10.56587
47	9.434569	9.983309	9.451260	10.548740	10.016691	10.56543
48	9.435016	9.983273	9.451743	10.548257	10.016720	10.56498
49	9.435462	9.983238	9.452225	10.547775	10.016762	10.56453
50	9.435908	9.983202	9.452706	10.547294	10.016798	10.56409
51	9.436353	9.983166	9.453187	10.546813	10.016834	10.56364
52	9.436798	9.983130	9.453668	10.546332	10.016870	10.56320
53	9.437242	9.983094	9.454148	10.545852	10.016906	10.56275
54	9.437686	9.983058	9.454628	10.545372	10.016942	10.56231
55	9.438129	9.983022	9.455107	10.544893	10.016978	10.56187
56	9.438572	9.982986	9.455586	10.544414	10.017014	10.56142
57	9.439014	9.982950	9.456064	10.543936	10.017050	10.56098
58	9.439456	9.982914	9.456542	10.543458	10.017086	10.56054
59	9.439897	9.982878	9.457019	10.542981	10.017122	10.56010
60	9.440338	9.982842	9.457496	10.542504	10.017159	10.55966
		Sine.		Tang.		Secant.

74 *Degrees.*

A Table of Artificial Sines,

16 *Degrees.*

Min.	Sine.		Tang.		Secant.		
0	9.440338	9.982842	9.457496	10.542504	10 017158	10.559662	60
1	9.440778	9.982805	9.457973	10.542027	10.017195	10.559222	59
2	9.441218	9.982769	9.458449	10.541551	10 017231	10.558782	58
3	9.441658	9.982733	9.458925	10.541075	10.017267	10.558342	57
4	9.442096	9.982696	9.459400	10.540600	10.017304	10.557903	56
5	9.442535	9.982660	9.459875	10.540125	10.017340	10.557465	55
6	9.442973	9.982623	9.460349	10.539651	10.017376	10.557027	54
7	9.443410	9.982587	9.460823	10.539177	10.017413	10.556590	53
8	9.443847	9.982551	9.461297	10.538703	10.017449	10.556153	52
9	9.444284	9.982514	9.461770	10.538230	10.017486	10.555716	51
10	9.444720	9.982477	9 462242	10.537758	10.017523	10.555280	50
11	9.445155	9.982441	9.462714	10.537285	10.017559	10.554845	49
12	9.445590	9.982404	9.463186	10.536814	10.017596	10.554410	48
13	9.446025	9.982367	9.463658	10.536342	10.017633	10.553975	47
14	9.446459	9.982331	9.464128	10.535871	10.017669	10.553541	46
15	9.446893	9.982294	9 464599	10.535401	10.017706	10.553107	45
16	9.447326	9.982257	9.465069	10.534931	10.017743	10.552674	44
17	9.447759	9.982220	9.465539	10.534461	10.017780	10.552241	43
18	9.448191	9.982183	9.466008	10.533992	10.017817	10.551809	42
19	9.448623	9.982146	9.466476	10 533523	10.017854	10.551377	41
20	9.449054	9.982109	9.466945	10.533055	10.017891	10.550946	40
21	9.449485	9.982072	9.467413	10.532587	10.017928	10.550515	39
22	9.449915	9.982035	9.467880	10.532120	10.017965	10.550085	38
23	9.450345	9.981998	9.468347	10.531653	10.018002	10.549655	37
24	9 450775	9.981961	9.468814	10.531186	10.018039	10.549225	36
25	9.451204	9.981924	9.469280	10.530720	10.018076	10.548796	35
26	9.451632	9.981886	9.469746	10.530254	10.018114	10.548368	34
27	9.452060	9.981849	9.470211	10.529789	10.018151	10.547940	33
28	9.452488	9.981812	9.470676	10.529324	10.018188	10.547512	32
29	9.452915	9.981774	9.471141	10.528859	10.018226	10.547085	31
30	9.453342	9.981737	9.471605	10.528395	10.018263	10.546658	30
		Sine.		Tang.		Secant.	Min.

73 *Degrees.*

Tangents and Secants.

16 Degrees.

Min.	Sine.		Tang.		Secant.		
30	9.453342	9.981737	9.471605	10.528395	10.018263	10.546658	30
31	9.453768	9.981699	9.472068	10.527931	10.018300	10.546233	29
32	9.454194	9.981662	9.472532	10.527468	10.018338	10.545806	28
33	9.454619	9.981624	9.472995	10.527005	10.018375	10.545381	27
34	9.455044	9.981587	9.473457	10.526543	10.018413	10.544956	26
35	9.455469	9.981549	9.473919	10.526081	10.018451	10.544531	25
36	9.455893	9.981512	9.474381	10.525619	10.018488	10.544107	24
37	9.456316	9.981474	9.474842	10.525158	10.018526	10.543684	23
38	9.456739	9.981436	9.475303	10.524697	10.018564	10.543261	22
39	9.457162	9.981399	9.475763	10.524237	10.018601	10.542838	21
40	9.457584	9.981361	9.476223	10.523777	10.018639	10.542416	20
41	9.458006	9.981323	9.476683	10.523317	10.018677	10.541994	19
42	9.458427	9.981285	9.477142	10.522858	10.018715	10.541573	18
43	9.458848	9.981247	9.477601	10.522399	10.018753	10.541152	17
44	9.459268	9.981209	9.478059	10.521941	10.018791	10.540732	16
45	9.459688	9.981171	9.478517	10.521483	10.018829	10.540312	15
46	9.460108	9.981133	9.478975	10.521025	10.018867	10.539892	14
47	9.460527	9.981095	9.479432	10.520568	10.018905	10.539473	13
48	9.460946	9.981057	9.479889	10.520111	10.018943	10.539054	12
49	9.461364	9.981019	9.480345	10.519655	10.018981	10.538636	11
50	9.46178[illegible]	9.980980	9.480801	10.519199	10.019019	10.538218	10
51	9.462199	9.980942	9.481257	10.518743	10.019058	10.537802	9
52	9.462616	9.980904	9.481712	10.518288	10.019096	10.537384	8
53	9.463032	9.980866	9.482167	10.517833	10.019134	10.536968	7
54	9.463448	9.980927	9.482621	10.517379	10.019173	10.536552	6
55	9.463864	9.980789	9.483075	10.516925	10.019211	10.536136	5
56	9.464279	9.980750	9.483529	10.516471	10.019249	10.535721	4
57	9.464694	9.980712	9.483982	10.516018	10.019288	10.535306	3
58	9.465108	9.980673	9.484435	10.515565	10.019326	10.534892	2
59	9.465552	9.980635	9.484887	10.515113	10.019365	10.534478	1
60	9.465935	9.980596	9.485339	10.514661	10.019404	10.534065	0
		Sine.		Tang.		Secant.	Min.

73 *Degrees.*

A Table of Artificial Sines,

17 *Degrees.*

	Sine.		Tang.		Secant.		
	9.465935	9.980596	9.485339	10.514661	10.019404	10.534065	60
	9.466348	9.980558	9.485791	10.514209	10.019442	10.533652	59
	9.466761	9.980519	9.486242	10.513758	10.019481	10.533239	58
	9.467173	9.980480	9.486693	10.513307	10.019520	10.532827	57
	9.467585	9.980441	9.487143	10.512857	10.019558	10.532415	56
	9.467996	9.980403	9.487593	10.512407	10.019597	10.532004	55
	9.468407	9.980364	9.488043	10.511957	10.019636	10.531593	54
7	9.468817	9.980325	9.488492	10.511508	10.019675	10.531183	53
8	9.469227	9.980286	9.488941	10.511059	10.019714	10.530773	52
9	9.469637	9.980247	9.489390	10.510610	10.019753	10.530363	51
0	9.470046	9.980208	9.489838	10.510162	10.019792	10.539954	50
1	9.470455	9.980169	9.490286	10.509714	10.019831	10.539545	49
2	9.470863	9.980130	9.490733	10.509267	10.019870	10.529137	48
3	9.471271	9.980091	9.491180	10.508820	10.019909	10.528729	47
4	9.471678	9.980052	9.491627	10.508373	10.019948	10.528231	46
5	9.472086	9.980012	9.492073	10.507927	10.019988	10.527914	45
6	9.472492	9.979973	9.492519	10.507481	10.020027	10.527508	44
7	9.472898	9.979934	9.492965	10.507035	10.020066	10.527101	43
8	9.473304	9.979895	9.493410	10.506590	10.020105	10.526696	42
9	9.473710	9.979855	9.493854	10.506145	10.020145	10.526290	41
0	9.474115	9.979816	9.494299	10.505701	10.020184	10.525885	40
1	9.474519	9.979776	9.494743	10.505257	10.020224	10.525481	39
2	9.474923	9.979737	9.495186	10.504813	10.020263	10.525077	38
3	9.475327	9.979697	9.495630	10.504370	10.020303	10.524673	37
4	9.475730	9.979659	9.496073	10.503927	10.020342	10.524270	36
5	9.476133	9.979618	9.496515	10.503485	10.020382	10.523867	35
6	9.476536	9.979578	9.496957	10.503043	10.020421	10.523464	34
7	9.476938	9.979539	9.497399	10.502601	10.020461	10.523062	33
8	9.477340	9.979499	9.497841	10.502159	10.020501	10.522660	32
9	9.477741	9.979459	9.498282	10.501718	10.020541	10.522259	31
0	9.478142	9.979419	9.498722	10.501278	10.020580	10.521858	30
		Sine.		Tang.		Secant.	Min.

72 *Degrees.*

Tangents and Secants.

17 *Degrees.*

Min.	Sine.		Tang.		Secant.		
30	9.478142	9.979419	9.498722	10.501278	10.020580	10.521858	3
31	9.478542	9.979380	9.499163	10.500837	10.020620	10.521458	2
32	9.478942	9.979340	9.499603	10.500397	10.020660	10.521058	2
33	9.479342	9.979300	9.500042	10.499958	10.020700	10.520658	2
34	9.479741	9.979260	9.500481	10.499519	10.020740	10.520258	2
35	9.480140	9.979220	9.500920	10.499080	10.020780	10.519860	2
36	9.480538	9.979180	9.501359	10.498641	10.020820	10.519461	2
37	9.480937	9.979140	9.501797	10.498203	10.020860	10.519063	2
38	9.481334	9.979100	9.502235	10.497765	10.020900	10.518666	2
39	9.481731	9.979059	9.502672	10.497328	10.020941	10.518268	2
40	9.482128	9.979019	9.503109	10.496891	10.020981	10.517872	2
41	9.482525	9.978979	9.503546	10.496454	10.021021	10.517475	1
42	9.482921	9.978939	9.503982	10.496018	10.021061	10.517079	1
43	9.483316	9.978898	9.504418	10.495582	10.021102	10.516683	1
44	9.483712	9.978858	9.504854	10.495146	10.021142	10.516288	1
45	9.484107	9.978817	9.505289	10.494711	10.021182	10.515893	1
46	9.484501	9.978777	9.505724	10.494276	10.021223	10.515499	1
47	9.484895	9.978736	9.506159	10.493841	10.021263	10.515105	1
48	9.485289	9.978696	9.506593	10.493407	10.021304	10.514711	1
49	9.485682	9.978655	9.507027	10.492973	10.021345	10.514318	1
50	9.486075	9.978615	9.507460	10.492540	10.021385	10.513925	1
51	9.486467	9.978574	9.507893	10.492107	10.021426	10.513533	9
52	9.486859	9.978533	9.508326	10.491674	10.021467	10.513140	8
53	9.487251	9.978493	9.508759	10.491241	10.021507	10.512749	7
54	9.487643	9.978452	9.509191	10.490809	10.021548	10.512357	6
55	9.488033	9.978411	9.509622	10.490378	10.021589	10.511966	5
56	9.488424	9.978370	9.510054	10.489946	10.021630	10.511576	4
57	9.488814	9.978329	9.510485	10.489515	10.021671	10.511186	3
58	9.489204	9.978288	9.510916	10.489084	10.021712	10.510796	2
59	9.489593	9.978247	9.511346	10.488654	10.021753	10.510407	1
60	9.489982	9.978206	9.511776	10.488224	10.021794	10.510018	0
		Sine.		Tang.		Secant.	

A Table of Artificial Sines,

18 *Degrees.*

Min	Sine.		Tang.		Secant.		
0	9.489982	9.978206	9.511776	10.488224	10.021794	10.510018	60
1	9.490371	9.978165	9.512206	10.487794	10.021835	10.509629	59
2	9.490759	9.978142	9.512635	10.487365	10.021876	10.509241	58
3	9.491147	9.978083	9.513064	10.486396	10.021917	10.508853	57
4	9.491534	9.978042	9.513493	10.486507	10.021958	10.508465	56
5	9.491922	9.978001	9.513921	10.486079	10.021999	10.508070	55
6	9.492308	9.977959	9.514349	10.485651	10.022041	10.507692	54
7	9.492695	9.977918	9.514777	10.485223	10.022082	10.507305	53
8	9.493081	9.977877	9.515204	10.484796	10.022123	10.506919	52
9	9.493466	9.977835	9.515631	10.484369	10.022165	10.506534	51
10	9.493851	9.977794	9.516057	10.483942	10.022206	10.506149	50
11	9.494236	9.977752	9.516484	10.483516	10.022248	10.505764	49
12	9.494620	9.977711	9.516910	10.483090	10.022289	10.505379	48
13	9.495005	9.977669	9.517335	10.482665	10.022331	10.504995	47
14	9.495388	9.977628	9.517761	10.482239	10.022372	10.504612	46
15	9.495772	9.977586	9.518185	10.481814	10.022414	10.504228	45
16	9.496154	9.977544	9.518610	10.481390	10.022456	10.503845	44
17	9.496537	9.977503	9.519034	10.480966	10.022497	10.503463	43
18	9.496919	9.977461	9.519458	10.480542	10.022539	10.503081	42
19	9.497301	9.977419	9.519882	10.480118	10.022581	10.502699	41
20	9.497682	9.977377	9.520305	10.479695	10.022623	10.502318	40
21	9.498063	9.977335	9.520728	10.479272	10.022665	10.501936	39
22	9.498444	9.977293	9.521151	10.478849	10.022707	10.501556	38
23	9.498824	9.977251	9.521573	10.478427	10.022748	10.501175	37
24	9.499204	9.977209	9.521995	10.478005	10.022790	10.500795	36
25	9.499584	9.977167	9.522417	10.477583	10.022833	10.500416	35
26	9.499964	9.977125	9.522838	10.477162	10.022875	10.500037	34
27	9.500342	9.977083	9.523259	10.476741	10.022917	10.499658	33
28	9.500721	9.977041	9.523679	10.476320	10.022959	10.499279	32
29	9.501099	9.976999	9.524100	10.475900	10.023001	10.498901	31
30	9.501576	9.976957	9.524520	10.475480	10.023043	10.498524	30
		Sine.		Tang.		Secant.	Min.

71 *Degrees.*

18 *Degrees.*

Min.	Sine.		Tang.		Secant.		
30	9.501476	9.976957	9.524520	10.475480	10.023943	10.498524	30
31	9.501854	9.976914	9.524939	10.475060	10.023086	10.498146	29
32	9.502231	9.976872	9.525359	10.474641	10.023128	10.497769	28
33	9.502607	9.976830	9.525778	10.474222	10.023170	10.497392	27
34	9.502984	9.976787	9.526197	10.473803	10.023213	10.497016	26
35	9.503360	9.976745	9.526615	10.473385	10.023255	10.496640	25
36	9.503735	9.976702	9.527033	10.472967	10.023298	10.496265	24
37	9.504110	9.976660	9.527451	10.472549	10.023340	10.495889	23
38	9.504485	9.976617	9.527868	10.472132	10.023383	10.495515	22
39	9.504860	9.976574	9.528285	10.471715	10.023425	10.495140	21
40	9.505234	9.976532	9.528702	10.471298	10.023468	10.494766	20
41	9.505608	9.976489	9.529119	10.470881	10.023511	10.494392	19
42	9.505981	9.976446	9.529535	10.470465	10.023554	10.494019	18
43	9.506354	9.976404	9.529950	10.470049	10.023596	10.493646	17
44	9.506727	9.976361	9.530366	10.469634	10.023639	10.493273	16
45	9.507099	9.976318	9.530781	10.469219	10.023682	10.492901	15
46	9.507471	9.976275	9.531196	10.468804	10.023725	10.492529	14
47	9.507842	9.976232	9.531611	10.468389	10.023768	10.492157	13
48	9.508214	9.976189	9.532025	10.467975	10.023811	10.491786	12
49	9.508585	9.976146	9.532439	10.467561	10.023854	10.491415	11
50	9.508956	9.976103	9.532853	10.467147	10.023897	10.491044	10
51	9.509326	9.976060	9.533266	10.466734	10.023940	10.490674	9
52	9.509696	9.976017	9.533679	10.466321	10.023983	10.490304	8
53	9.510065	9.975974	9.534092	10.465908	10.024026	10.489935	7
54	9.510434	9.975930	9.534504	10.465496	10.024070	10.489566	6
55	9.510803	9.975887	9.534916	10.465084	10.024113	10.489197	5
56	9.511172	9.975844	9.535328	10.464672	10.024156	10.488828	4
57	9.511540	9.975800	9.535739	10.464261	10.024200	10.488460	3
58	9.511907	9.975757	9.536150	10.463849	10.024243	10.488093	2
59	9.512275	9.975713	9.536561	10.463439	10.024287	10.487725	1
60	9.512642	9.975670	9.536977	10.463028	10.024330	10.487358	0
		Sine.		Tang.		Secant.	Min.

71 *Degrees.*

A Table of Artificial Sines,

19 *Degrees.*

ine.		Tang.		Secant.		
12642	9.975670	9.536972	10.463028	10.024330	10.487358	60
13009	9.975626	9.537382	10.462618	10.024373	10.486991	59
13375	9.975583	9.537792	10.462208	10.024417	10.486625	58
13741	9.975539	9.538202	10.461798	10.024461	10.486259	57
14107	9.975496	9.538611	10.461389	10.024504	10.485893	56
14472	9.975452	9.539020	10.460980	10.024548	10.485528	55
14837	9.975408	9.539429	10.460571	10.024592	10.485163	54
15202	9.975365	9.539837	10.460163	10.024635	10.484798	53
15566	9.975321	9.540245	10.459755	10.024679	10.484434	52
15930	9.975277	9.540653	10.459347	10.024723	10.484070	51
16294	9.975233	9.541061	10.458939	10.024767	10.483706	50
16657	9.975189	9.541468	10.458532	10.024811	10.483343	49
17020	9.975145	9.541875	10.458125	10.024855	10.482980	48
17382	9.975101	9.542281	10.457719	10.024899	10.482618	47
17745	9.975057	9.542688	10.457312	10.024943	10.482255	46
18107	9.975013	9.543094	10.456906	10.024987	10.481893	45
18468	9.974969	9.543499	10.456501	10.025031	10.481532	44
18829	9.974925	9.543905	10.456095	10.025075	10.481170	43
19192	9.974880	9.544310	10.455690	10.025120	10.480810	42
19551	9.974836	9.544715	10.455285	10.025164	10.480449	41
19911	9.974792	9.545119	10.454881	10.025208	10.480089	40
20271	9.974747	9.545524	10.454476	10.025252	10.479729	39
20631	9.974703	9.545928	10.454072	10.025297	10.479369	38
20990	9.974659	9.546331	10.453669	10.025341	10.479010	37
21349	9.974614	9.546735	10.453265	10.025386	10.478651	36
21707	9.974570	9.547138	10.452862	10.025430	10.478293	35
22066	9.974525	9.547540	10.452459	10.025475	10.477934	34
22423	9.974481	9.547943	10.452057	10.025511	10.477576	33
22781	9.974436	9.548345	10.451655	10.025564	10.477219	32
23138	9.974391	9.548747	10.451253	10.025609	10.476862	31
23495	9.974347	9.549149	10.450851	10.025653	10.476505	30
	Sine.		Tang.		Secant.	Min.

70 *Degrees.*

19 Degrees.

Min.	Sine.		Tang.		Secant.		
30	9.523495	9.974347	9.549149	10.450851	10.025653	10.476505	30
31	9.523852	9.974302	9.549550	10.450450	10.025698	10.476148	29
32	9.524208	9.974257	9.549951	10.450049	10.025743	10.475792	28
33	9.524564	9.974212	9.550352	10.449648	10.025788	10.475436	27
34	9.524920	9.974167	9.550752	10.449248	10.025833	10.475080	26
35	9.525275	9.974122	9.551152	10.448847	10.025873	10.474725	25
36	9.525630	9.974077	9.551552	10.448448	10.025923	10.474370	24
37	9.525984	9.974032	9.551952	10.448048	10.025968	10.474016	23
38	9.526339	9.973987	9.552352	10.447649	10.026013	10.473661	22
39	9.526692	9.973942	9.552750	10.447250	10.026058	10.473307	21
40	9.527046	9.973897	9.553149	10.446851	10.026103	10.472954	20
41	9.527400	9.973852	9.553548	10.446452	10.026148	10.472600	19
42	9.527753	9.973807	9.553946	10.446054	10.026193	10.472247	18
43	9.528105	9.973761	9.554344	10.445656	10.026238	10.471895	17
44	9.528458	9.973716	9.554741	10.445258	10.026284	10.471542	16
45	9.528810	9.973671	9.555139	10.444861	10.026329	10.471190	15
46	9.529161	9.973625	9.555536	10.444464	10.026374	10.470839	14
47	9.529513	9.973580	9.555933	10.444067	10.026420	10.470487	13
48	9.529864	9.973535	9.556329	10.443671	10.026465	10.470136	12
49	9.530215	9.973489	9.556725	10.443274	10.026511	10.469785	11
50	9.530565	9.973443	9.557121	10.442879	10.026556	10.469435	10
51	9.530915	9.973398	9.557517	10.442483	10.026602	10.469085	9
52	9.531265	9.973352	9.557912	10.442086	10.026648	10.468735	8
53	9.531614	9.973307	9.558308	10.441692	10.026693	10.468386	7
54	9.531963	9.973261	9.558702	10.441297	10.026739	10.468036	6
55	9.532312	9.973215	9.559097	10.440903	10.026785	10.467688	
56	9.532661	9.973169	9.559491	10.440509	10.026831	10.467339	
57	9.533009	9.973124	9.559885	10.440115	10.026876	10.466991	
58	9.533357	9.973078	9.560279	10.439721	10.026922	10.466643	
59	9.533704	9.973032	9.560673	10.439327	10.026968	10.466296	
60	9.534052	9.972986	9.561066	10.438934	10.027014	10.465948	
		Sine.		Tang.		Secant.	Min.

70 Degrees.

A Table of Artificial Sines,

20 *Degrees.*

	Sine.		Tang.		Secant.		
0	9.534052	9.972986	9.561066	10.438934	10.027014	10.465948	60
1	9.534399	9.972940	9.561459	10.438541	10.027060	10.465601	59
2	9.534745	9.972894	9.561851	10.438184	10.027106	10.465255	58
3	9.535091	9.972848	9.562244	10.437756	10.027152	10.464908	57
4	9.535437	9.972802	9.562636	10.437364	10.027198	10.464562	56
5	9.535783	9.972755	9.563028	10.436972	10.027245	10.464217	55
6	9.536129	9.972709	9.563419	10.436581	10.027291	10.463871	54
7	9.536474	9.972663	9.563811	10.436189	10.027337	10.463526	53
8	9.536818	9.972617	9.564202	10.435798	10.027383	10.463182	52
9	9.537163	9.972570	9.564592	10.435407	10.027430	10.46283	51
0	9.537507	9.972524	9.564983	10.435017	10.027476	10.462493	50
1	9.537851	9.972477	9.565373	10.434627	10.027522	10.462145	49
2	9.538194	9.972431	9.565763	10.434237	10.027569	10.461806	48
3	9.538537	9.972384	9.566153	10.433847	10.027615	10.461462	47
4	9.538880	9.972338	9.566542	10.433458	10.027662	10.461120	46
5	9.539223	9.972291	9.566932	10.433068	10.027709	10.460777	45
6	9.539565	9.972245	9.567320	10.432679	10.027755	10.460435	44
7	9.539907	9.972198	9.567709	10.432291	10.027802	10.460093	43
8	9.540249	9.972151	9.568097	10.431902	10.027849	10.459751	42
9	9.540590	9.972105	9.568486	10.431514	10.02789	10.459410	41
0	9.540931	9.972058	9.568873	10.431126	10.027942	10.45906	40
1	9.541272	9.972011	9.569261	10.430739	10.027989	10.45872	9
2	9.541613	9.971964	9.569648	10.430352	10.028036	10.45338	
3	9.541953	9.971917	9.570035	10.429964	10.028083	10.45804	
4	9.542293	9.971870	9.570422	10.429578	10.028130	10.45770	
5	9.542632	9.971823	9.570809	10.429191	10.028177	10.457368	
6	9.542971	9.971776	9.571195	10.428805	10.028224	10.45702	
7	9.543310	9.971729	9.571581	10.428419	10.028271	10.45669	
8	9.543649	9.971682	9.571967	10.428033	10.028318	10.45635	
9	9.543987	9.971635	9.572352	10.427648	10.038365	10.45601	
0	9.544325	9.971588	9.572738	10.427262	10.028412	10.45567	
		Sine.		Tang.		Secant.	

69 *Degrees.*

Tangents and Secants.

20 Degrees.

Min.	Sine.		Tang.		Secant.		
30	9.544325	9.971588	9.572738	10.427262	10.028412	10.455675	30
31	9.544663	9.971540	9.573123	10.426877	10.028460	10.455337	29
32	9.545000	9.971493	9.573507	10.426493	10.028507	10.454999	28
33	9.545338	9.971446	9.573892	10.426108	10.028554	10.454662	27
34	9.545674	9.971398	9.574276	10.425724	10.028602	10.454325	26
35	9.546011	9.971351	9.574660	10.425340	10.028649	10.453989	25
36	9.546347	9.971303	9.575044	10.424956	10.028696	10.453653	24
37	9.546683	9.971256	9.575429	10.424573	10.028744	10.453317	23
38	9.547019	9.971208	9.575810	10.424190	10.028792	10.452981	22
39	9.547354	9.971161	9.576193	10.423807	10.028839	10.452646	21
40	9.547689	9.971113	9.576576	10.423424	10.028887	10.452311	20
41	9.548024	9.971065	9.576958	10.423041	10.028934	10.451976	19
42	9.548358	9.971018	9.577341	10.422659	10.028982	10.451641	18
43	9.548693	9.970970	9.577723	10.422277	10.029030	10.451307	17
44	9.549027	9.970922	9.578104	10.421896	10.029078	10.450973	16
45	9.549360	9.970874	9.578486	10.421514	10.029126	10.450640	15
46	9.549693	9.970826	9.578867	10.421133	10.029173	10.450306	14
47	9.550026	9.970779	9.579248	10.420752	10.029221	10.449973	13
48	9.550359	9.970731	9.579629	10.420371	10.029265	10.449641	12
49	9.550692	9.970683	9.580009	10.419991	10.029317	10.449308	11
50	9.551024	9.970635	9.580389	10.419611	10.029365	10.448976	
51	9.551356	9.970586	9.580769	19.419231	19.029413	10.448644	
52	9.551687	9.970538	9.581149	10.418851	10.029462	10.448313	
53	9.552018	9.970490	9.581528	10.418472	10.029510	10.447982	
54	9.552349	9.970442	9.581907	10.418093	10.029558	10.447651	
55	9.552680	9.970394	9.582286	10.417714	10.029606	10.447320	
56	9.553010	9.970345	9.582665	10.417335	10.029655	10.446989	
57	9.553341	9.970297	9.583043	10.416956	10.029702	10.446659	
58	9.553670	9.970249	9.583422	10.416578	10.029751	10.446330	
59	9.554000	9.970200	9.583800	10.416200	10.029800	10.446000	
60	9.554329	9.970152	9.584177	10.415823	10.029848	10.445671	
		Sine.		Tang.		Secant.	Min.

A Table of Artificial Sines,

21 *Degrees.*

Min	Sine.		Tang.		Secant.		
0	9.554329	9.970152	9.584177	10.415823	10.029848	10.445671	60
1	9.554658	9.970103	9.584555	10.415445	10.029897	10.445342	59
2	9.554987	9.970055	9.584932	10.415068	10.029945	10.445013	58
3	9.555315	9.970006	9.585309	10.414691	10.039994	10.444685	57
4	9.555643	9.969957	9.585686	10.414314	10.030043	10.444357	56
5	9.555971	9.969909	9.586062	10.413938	10.030091	10.444014	55
6	9.556299	9.969860	9.586439	10.413561	10.030140	10.443701	54
7	9.556626	9.969811	9.586815	10.413185	10.030189	10.443374	53
8	9.556953	9.969762	9.587190	10.412810	10.030238	10.443047	52
9	9.557280	9.969714	9.587566	10.412434	10.030286	10.442720	51
10	9.557606	9.969665	9.587941	10.412059	10.030335	10.442394	50
11	9.557932	9.969616	9.588316	10.411684	0.0030384	10.442068	49
12	9.558258	9.969567	9.588691	10.411309	10.030433	10.441742	48
13	9.558583	9.969518	9.589066	10.410933	10.030482	10.441416	47
14	9.558909	9.969469	9.589440	10.410560	10.030531	10.441092	46
15	9.559234	9.969420	9.589814	10.410186	10.030580	10.440761	45
16	9.559558	9.969370	9.590188	10.409812	10.030630	10.440441	44
17	9.559883	9.969321	9.590562	10.409438	10.030679	10.440117	43
18	9.560207	9.969272	9.590935	10.409065	10.030728	10.439793	42
19	9.560531	9.969223	9.591308	10.408692	10.030777	10.439465	41
20	9.560855	9.969173	9.591681	10.408319	10.030827	10.439145	40
21	9.561178	9.969124	9.592054	10.407946	10.030876	10.438822	39
22	9.561501	9.969075	9.592426	10.407574	10.030925	10.438499	38
23	9.561824	9.969025	9.592798	10.407201	10.030975	10.438176	37
24	9.562146	9.968976	9.593170	10.406829	10.031024	10.437854	36
25	9.562468	9.968926	9.593542	10.406458	10.031074	10.437531	35
26	9.562795	9.968877	9.593914	10.406086	10.031123	10.437210	34
27	9.563112	9.968827	9.594285	10.405715	10.031173	10.436888	33
28	9.563433	9.968777	9.594656	10.405344	10.031223	10.436566	32
29	9.563755	9.968728	9.595027	10.404973	10.031272	10.436245	31
30	9.564075	9.968678	9.595397	10.404602	10.031322	10.435925	30
		Sine.		Tang.		Secant.	Min

68 *Degrees.*

21 Degrees.

Min.	Sine.		Tang.		Secant.	
30	9.564075	9.968678	9.595397	10.404602	10.031322	10.4359
31	9.564396	9.968628	9.595768	10.404232	10.031372	10.4356
32	9.564716	9.968578	9.596138	10.403862	10.031422	10.4352
33	9.565036	9.968528	9.596508	10.403492	10.031472	10.4349
34	9.565356	9.968478	9.596878	10.403122	10.031521	10.4346
35	9.565676	9.968429	9.597247	10.402753	10.031571	10.4343
36	9.565995	9.968379	9.597616	10.402384	10.031621	10.4340
37	9.566314	9.968328	9.597985	10.402015	10.031671	10.4336
38	9.566632	9.968278	9.598354	10.401646	10.031722	10.4333
39	9.566951	9.968228	9.598722	10.401277	10.031772	10.4330
40	9.567269	9.968178	9.599091	10.400909	10.031822	10.43273
41	9.567587	9.968128	9.599459	10.400541	10.031872	10.43241
42	9.567904	9.968078	9.599827	10.400173	10.031922	10.43209
43	9.568222	9.968027	9.600194	10.399806	10.031973	10.43177
44	9.568539	9.967977	9.600562	10.399438	10.032023	10.43146
45	9.568855	9.967927	9.600929	10.399071	10.032073	10.43114
46	9.569172	9.967876	9.601296	10.398704	10.032124	10.43082
47	9.569488	9.967826	9.601662	10.398337	10.032174	10.43051
48	9.569804	9.967775	9.602029	10.397971	10.032225	10.43019
49	9.570120	9.967725	9.602395	10.397605	10.032275	10.42988
50	9.570435	9.967674	9.602761	10.397239	10.032326	10.42956
51	9.570751	9.967623	9.603127	10.396873	10.032376	10.42924
52	9.571066	9.967573	9.603493	10.396507	10.032427	10.42893
53	9.571380	9.967522	9.603858	10.396142	10.032478	10.42862
54	9.571695	9.967471	9.604223	10.395777	10.032529	10.42830
55	9.572009	9.967420	9.604588	10.395412	10.032579	10.42799
56	9.572323	9.967370	9.604953	10.395047	10.032630	10.42767
57	9.572636	9.967319	9.605317	10.394683	10.032681	10.42736
58	9.572949	9.967268	9.605682	10.394318	10.032732	10.42705
59	9.573263	9.967217	9.606046	10.393954	10.032783	10.42673
60	9.573575	9.967166	9.606410	10.393590	10.032834	10.42642
		Sine.		Tang.		Secant.

68 Degrees.

A Table of Ar[illegible]cial Sines,

22 *Degrees.*

Min.	Sine.		Tang.		Secant.		
0	9.573575	9.967166	9.606410	10.393590	10.032834	10.426425	60
1	9.573888	9.967115	9.606773	10.393227	10.032885	10.426112	59
2	9.574200	9.967064	9.607137	10.392863	10.032936	10.425800	58
3	9.574512	9.967012	9.607500	10.392500	10.032987	10.425488	57
4	9.574824	9.966961	9.607863	10.392137	10.033039	10.425176	56
5	9.575136	9.966910	9.608225	10.391775	10.033090	10.424864	55
6	9.575447	9.966859	9.608588	10.391412	10.033141	10.424553	54
7	9.575758	9.966807	9.608950	10.391050	10.033192	10.424242	53
8	9.576068	9.966756	9.609312	10.390688	10.033244	10.423931	52
9	9.576379	9.966705	9.609674	10.390326	10.033295	10.423621	51
10	9.576689	9.966653	9.610036	10.389964	10.033347	10.423311	50
11	9.576999	9.966602	9.610397	10.389602	10.033398	10.423001	49
12	9.577309	9.966550	9.610759	10.389241	10.033450	10.422691	48
13	9.577618	9.966499	9.611120	10.388880	10.033501	10.422382	47
14	9.577927	9.966447	9.611480	10.388520	10.033553	10.422072	46
15	9.578236	9.966395	9.611841	10.388159	10.033605	10.421764	45
16	9.578545	9.966344	9.612001	10.387799	10.033656	10.421455	44
17	9.578853	9.966292	9.612561	10.387438	10.033708	10.421146	43
18	9.579162	9.966240	9.612921	10.387079	10.033760	10.420838	42
19	9.579469	9.966188	9.613281	10.386719	10.033812	10.420530	41
20	9.579777	9.966136	9.613641	10.386359	10.033863	10.420233	40
21	9.580084	9.966085	9.614000	10.366000	10.033915	10.419915	39
22	9.580392	9.966033	9.614359	10.385641	10.033967	10.419608	38
23	9.580699	9.965981	9.614718	10.385282	10.034019	10.419301	37
24	9.581005	9.965928	9.615077	10.384923	10.034071	10.418995	36
25	9.581312	9.965876	9.615435	10.384565	10.034124	10.418688	35
26	9.581618	9.965824	9.615793	10.384207	10.034176	10.418382	34
27	9.581924	9.965772	9.616151	10.383849	10.034228	10.418076	33
28	9.582229	9.965720	9.616509	10.383491	10.034280	10.417771	32
29	9.582534	9.965668	9.616867	10.383133	10.034332	10.41[illegible]465	31
30	9.582840	9.965615	9.617224	10.382776	10.034385	10.417160	30
		Sine.		Tang.		Secant.	Min.

67 *Degrees.*

Tangents and Secants.

22 Degrees.

Min.	Sine.		Tang.		Secant.		
30	9.582840	9.965615	9.617224	10.382776	10.034385	10.417160	3
31	9.583144	9.965563	9.617581	10.382418	10.034437	10.416855	2
32	9.583449	9.965511	9.617938	10.382061	10.034489	10.416551	2
33	9.583753	9.965458	9.618295	10.381705	10.034542	10.416246	2
34	9.584058	9.965406	9.618652	10.381348	10.034594	10.415942	2
35	9.584361	9.965353	9.619008	10.380992	10.034647	10.415638	2
36	9.584665	9.965301	9.619364	10.380635	10.034699	10.415335	2
37	9.584968	9.965248	9.619720	10.380279	10.034752	10.415031	2
38	9.585272	9.965195	9.620076	10.379924	10.034805	10.414728	2
39	9.585574	9.965143	9.620432	10.379568	10.034857	10.414425	2
40	9.585877	9.965090	9.620787	10.379213	10.034910	10.414123	20
41	9.586179	9.965037	9.621142	10.378858	10.034963	10.413820	19
42	9.586482	9.964984	9.621497	10.378503	10.035016	10.413518	1
43	9.586783	9.964931	9.621852	10.378148	10.035069	10.413218	1
44	9.587085	9.964878	9.622207	10.377793	10.035121	10.412915	1
45	9.587386	9.964826	9.622561	10.377439	10.035174	10.412613	1
46	9.587688	9.964773	9.622915	10.377085	10.035227	10.412312	1
47	9.587988	9.964719	9.623269	10.376731	10.035280	10.412011	1
48	9.588289	9.964666	9.623623	10.376377	10.035333	10.411711	1
49	9.588591	9.964613	9.623976	10.376024	10.0353[illegible]	10.411410	1
50	9.588890	9.964560	9.624330	10.375670	10.035440	10.411110	1
51	9.589190	9.964507	9.624683	10.375317	10.035493	10.410810	
52	9.589489	9.964454	9.625036	10.374964	10.035546	10.410511	
53	9.589789	9.964400	9.625388	10.374612	10.035600	10.410211	
4	9.590088	9.964347	9.625741	10.374259	10.035659	10.409912	
55	9.590387	9.964294	9.626093	10.373907	10.035706	10.409613	
56	9.590686	9.964240	9.626445	10.373555	10.035760	10.409314	
57	9.590984	9.964187	9.626797	10.373203	10.035813	10.409016	
58	9.591282	9.964133	9.627149	10.372851	10.035867	10.408718	
59	9.591580	9.964080	9.627501	10.372499	10.035920	10.40842	
60	9.591878	9.964026	9.627852	10.372145	10.035974	10.40812	
		Sine.		Tang.		Secant.	

67 Degrees.

A Table of Artificial Sines,

23 *Degrees.*

Min.	Sine.		Tang.		Secant.		
0	9.591878	9.964026	9.627852	10.372148	10.035974	10.408122	60
1	9.592175	9 963972	9.628203	10.371797	10.036028	10.407824	59
2	9.592473	9.963919	9.628554	10.371448	10.036081	10 407527	58
3	9.592770	9 963865	9.628905	10.371095	10.036135	10 407230	57
4	9 593067	9.963811	9.629255	10.370745	10 036189	10.406933	56
5	9.593363	9.963757	9.629606	10 370394	10.036243	10.406637	55
6	9.593659	9.963704	9.629956	10.370044	10.036296	10.406341	54
7	9.593955	9 963650	9.630306	10.369694	10.036350	10 406044	53
8	9.594251	9.963596	9.630656	10.369344	10.036404	10.405749	52
9	9.594547	9.963542	9.631005	10.368995	10.036458	10.405453	51
10	9.594842	9.963488	9.631354	10.368645	10.036512	10.405158	50
11	9 595137	9 963434	9.631704	10.368296	10.036566	10.404863	49
12	9.595432	9.963379	9.632053	10.367947	10.036620	10.404568	48
13	9.595727	9.963325	9.632401	10.367598	10.036675	10.404273	47
14	9.596021	9.963271	9.632750	10.367250	10.036729	10.453979	46
15	9.596315	9.963217	9.633098	10.366901	10.036783	10.403685	45
16	9.596609	9.963162	9.633447	10.366553	10.036837	10.403391	44
17	9.596903	9.963108	9.633795	10.366205	10.036892	10.403097	43
18	9.597196	9.963054	9.634143	10.365857	10.036946	10.402803	42
19	9.597490	9.962999	9.634490	10.365510	10.037001	10.402510	41
20	9.597783	9.962945	9.634838	10.365162	10.037055	10.402217	40
21	9 598075	9 962890	9.635185	10.364815	10.037110	10.401925	39
22	9.598368	9.962836	9.635532	10.364468	10.037164	10.401632	38
23	9.598660	9.962781	9.635879	10.364121	10.037219	10.401340	37
24	9.598952	9.962727	9.636226	10 363774	10.037273	10.401048	36
25	9.599244	9.962672	9.636572	10.363428	10.037328	10.400756	35
26	9.599536	9 962617	9.636918	10.363081	10.037383	10.400464	34
27	9.599827	9.962562	9.637265	10.362735	10.037438	10 400173	33
28	9.600118	9.962508	9 637611	10.362389	10.037492	10.409882	32
29	9.600409	9.962453	9.637956	10.362044	10.037547	10.409591	31
30	9.600700	9.962398	9.638302	10 361698	10.037602	10.409300	30
		Sine.		Tang.		Secant.	Min.

66 *Degrees.*

Tangents and Secants.

23 *Degrees.*

Min.	Sine.		Tang.		Secant.		
30	9.600700	9.962398	9.638302	10.361698	10.037602	10.399300	30
31	9.600990	9.962343	9.638647	10.361353	10.037657	10.399010	29
32	9.601280	9.962288	9.638992	10.361007	10.037712	10.398720	28
33	9.601570	9.962233	9.639337	10.360662	10.037767	10.398430	27
34	9.601860	9.962178	9.639682	10.360318	10.037822	10.398140	26
35	9.602149	9.962123	9.640027	10.359973	10.037877	10.397850	25
36	9.602439	9.962067	9.640371	10.359629	10.037933	10.397561	24
37	9.602728	9.962012	9.640716	10.359284	10.037988	10.397272	23
38	9.603017	9.961957	9.641050	10.358940	10.038043	10.396983	22
39	9.603305	9.961902	9.641404	10.358596	10.038098	10.396695	21
40	9.603594	9.961846	9.641747	10.358253	10.038154	10.396406	20
41	9.603882	9.961791	9.642091	10.357909	10.038209	10.396118	19
42	9.604170	9.961735	9.642434	10.357566	10.038264	10.395830	18
43	9.604457	9.961680	9.642777	10.357223	10.038320	10.395543	17
44	9.604745	9.961624	9.643120	10.356880	10.038375	10.395255	16
45	9.605032	9.961569	9.643463	10.356537	10.038431	10.394968	15
46	9.605319	9.961513	9.643806	10.356194	10.038487	10.394681	14
47	9.605606	9.961458	9.644148	10.355852	10.038542	10.394394	13
48	9.605892	9.961402	9.644490	10.355510	10.038598	10.394108	12
49	9.606179	9.961346	9.644832	10.355168	10.038654	10.393821	11
50	9.606465	9.961290	9.645174	10.354826	10.038710	10.393535	10
51	9.606751	9.961235	9.645516	10.354484	10.038765	10.393249	9
52	9.607036	9.961179	9.645857	10.354142	10.038821	10.392964	8
53	9.607322	9.961123	9.646199	10.353801	10.038877	10.392678	7
54	9.6076[illegible]	.961067	9.646540	10.353460	10.038933	10.392393	6
55	9.60789[illegible]	.961011	9.646881	10.353119	10.038989	10.392108	5
56	9.608175	.960955	9.647222	10.352778	10.039045	10.391823	4
57	9.608461	9.960899	9.647562	10.352438	10.039101	10.391531	3
58	9.608745	9.960843	9.647903	10.352097	10.039157	10.391255	2
59	9.609029	9.960786	9.648243	10.351757	10.039214	10.390971	1
60	9.609313	9.960730	9.648583	10.351417	10.039270	10.390687	0
		Sine.		Tang.		Secant.	Min.

66 *Degrees.*

A Table of Artificial Sines,

24 *Degrees.*

Min.	Sine.		Tang.		Secant.		
0	9.609313	9.960730	9.648583	10.351417	10.039270	10.390687	60
1	9.609597	9.960674	9.648923	10.351077	10.039326	10.390403	59
2	9.609880	9.960618	9.649263	10.350737	10.039382	10.390120	58
3	9.610163	9.960561	9.649602	10.350398	10.039439	10.389836	57
4	9.610446	9.960505	9.649942	10.350058	10.039495	10.389553	56
5	9.610729	9.960448	9.650281	10.349719	10.039552	10.389271	55
6	9.611012	9.960392	9.650620	10.349380	10.039608	10.388988	54
7	9.611294	9.960335	9.650959	10.349041	10.039665	10.388706	53
8	9.611576	9.960279	9.651297	10.348703	10.039721	10.388424	52
9	9.611858	9.960222	9.651636	10.348364	10.039778	10.388142	51
10	9.612140	9.960165	9.651974	10.348026	10.039834	10.387860	50
11	9.612421	9.960109	9.652312	10.347688	10.039891	10.387579	49
12	9.612702	9.960052	9.652650	10.347350	10.039948	10.387298	48
13	9.612983	9.959995	9.652988	10.347012	10.040005	10.387017	47
14	9.613264	9.959938	9.653326	10.346674	10.040062	10.386736	46
15	9.613545	9.959881	9.653653	10.346337	10.040118	10.386455	45
16	9.613825	9.959825	9.654000	10.346000	10.040175	10.386175	44
17	9.614105	9.959768	9.654337	10.345662	10.040232	10.385895	43
18	9.614385	9.959711	9.654674	10.345326	10.040289	10.385615	42
19	9.614665	9.959653	9.655011	10.344989	10.040347	10.385335	41
20	9.614944	9.959596	9.655348	10.344652	10.040404	10.385056	40
21	9.615223	9.959539	9.655684	10.344316	10.040461	10.384777	39
22	9.615502	9.959482	9.656020	10.343980	10.040518	10.384498	38
23	9.615781	9.959425	9.656356	10.343644	10.040575	10.384219	37
24	9.616060	9.959367	9.656692	10.343308	10.040632	10.383940	36
25	9.616338	9.959310	9.657028	10.342972	10.040690	10.383662	35
26	9.616616	9.959253	9.657364	10.342636	10.040747	10.383384	34
27	9.616894	9.959195	9.657699	10.342301	10.040805	10.383106	33
28	9.617172	9.959138	9.658034	10.341966	10.040862	10.382828	32
29	9.617450	9.959080	9.658369	10.341631	10.040919	10.382550	31
30	9.617727	9.959023	9.658704	10.341296	10.040977	10.382273	30
		Sine.		Tang.		Secant.	Min.

65 *Degrees.*

Tangents and Secants.

24 *Degrees,*

Min.	Sine.		Tang.		Secant.		
30	9.617727	9.959023	9.658704	10.341296	10.040977	10.382273	30
31	9.618004	9.958965	9.659039	10.340961	10.041035	10.381996	29
32	9.618281	9.958908	9.659373	10.340627	10.041092	10.381719	28
33	9.618558	9.958850	9.659708	10.340292	10.041150	10.381442	27
34	9.618834	9.958792	9.660942	10.339958	10.041208	10.381166	26
35	9.619110	9.958734	9.660376	10.339624	10.041265	10.380890	25
36	9.619386	9.958677	9.660710	10.339290	10.041323	10.380614	24
37	9.619662	9.958619	9.661043	10.338956	10.041381	10.380338	23
38	9.619938	9.958561	9.661377	10.338623	10.041439	10.380062	22
39	9.620213	9.958503	9.661710	10.338290	10 041497	10.379787	21
40	9.620488	9.958445	9.662043	10.337957	10.041555	10.379512	20
41	9.620763	9.958387	9.662376	10.337623	10 041613	10.379237	19
42	9.621038	9.958329	9.662709	10.337291	10.041671	10.378962	18
43	9.621313	9.958271	9.663042	10.336958	10.041729	10.378687	17
44	9.621587	9.958212	9.663374	10 336625	10.041787	10.378413	16
45	9 621861	9.958154	9.663707	10.336293	10.041846	10.378139	15
46	9.622135	9.958096	9.664039	10.335961	10.041904	10.377865	14
47	9.622409	9.958038	9.664371	10.335629	10.041962	10 377591	13
48	9.622682	9.957979	9.664703	10.335297	10.042021	10.377318	12
49	9.622956	9.957921	9.665035	10.334965	10.042079	10.377044	11
50	9.623229	9.957863	9.665366	10 334634	10.042137	10.376771	10
51	9.623502	9.957804	9.665697	10.334302	10.042196	10.376498	9
52	9.623774	9.957746	9.666029	10.333971	10.042254	10.376226	8
53	9.624047	9.957687	9.666360	10.333640	10.042313	10.375953	7
54	9.624319	9.957628	9.666691	10.333309	10.042372	10.375681	6
55	9.624591	9 957570	9.667021	10.332979	10.042430	10.375409	5
56	9.624863	9.957511	9.667352	10.332648	10.042489	10.375137	4
57	9.625135	9.957452	9.667682	10.332318	10 042548	10.474865	3
58	9.625406	9.957393	9.668013	10.331987	10.042607	10.374594	2
59	9.625677	9.957335	9.668343	10-331657	10.042665	10.374323	1
60	9.625948	9.957276	9.668672	10.331327	10.042724	10.374052	0
		Sine.		Tang.		Secant.	Min.

65 *Degrees.*

A Table of Artificial Sines,

25 *Degrees.*

Min.	Sine.		Tang.		Secant.		
0	9.625948	9.957276	9.668672	10.331327	10.042724	10.374052	60
1	9.626219	9.957217	9.669002	10.330998	10.042783	10.373781	59
2	9.626490	9.957158	9.669332	10.330668	10.042842	10.373510	58
3	9.626760	9.957099	9.669661	10.330339	10.042901	10.373240	57
4	9.627030	9.957040	9.669991	10.330009	10.042960	10.372970	56
5	9.627300	9.956981	9.670320	10.329680	10.043019	10.372700	55
6	9.627570	9.956921	9.670649	10.329351	10.043078	10.372430	54
7	9.627840	9.956862	9.670977	10.329023	10.043138	10.372160	53
8	9.628109	9.956803	9.671306	10.328694	10.043197	10.371891	52
9	9.628378	9.956744	9.671634	10.328365	10.043256	10.371622	51
10	9.628647	9.956684	9.671963	10.328037	10.043316	10.371353	50
11	9.628916	9.956625	9.672291	10.327709	10.043375	10.371084	49
12	9.629184	9.956566	9.672619	10.327381	10.043434	10.370815	48
13	9.629453	9.956506	9.672947	10.327053	10.043494	10.370547	47
14	9.629721	9.956447	9.673274	10.326725	10.043553	10.370279	46
15	9.62998	9.956387	9.673602	10.326398	10.043613	10.370011	45
16	9.630251	9.956327	9.673929	10.326071	10.043673	10.369743	44
17	9.630524	9.956268	9.674257	10.325743	10.043732	10.369476	43
18	9.630792	9.956208	9.674584	10.325416	10.043792	10.369208	42
19	9.631059	9.956148	9.674910	10.325089	10.043852	10.368941	41
20	9.631326	9.956089	9.675237	10.324763	10.043911	10.368674	40
21	9.63159	9.956029	9.675564	10.324436	10.043971	10.368407	39
22	9.631859	9.955969	9.675890	10.324110	10.044031	10.368141	38
23	9.632125	9.955909	9.676216	10.323783	10.044091	10.367874	37
24	9.632392	9.955849	9.676543	10.323457	10.044151	10.367608	36
25	9.632658	9.955789	9.676869	10.323131	10.044211	10.367342	35
26	9.632923	9.955729	9.677194	10.322806	10.044271	10.367077	34
27	9.633189	9.955669	9.677520	10.322480	10.044331	10.366811	33
28	9.633454	9.955609	9.677846	10.322154	10.034391	10.366546	32
29	9.633719	9.955548	9.678171	10.321829	10.044451	10.366281	31
30	9.633984	9.955488	9.678496	10.321504	10.044512	10.366016	30
		Sine.		Tang.		Secant.	Min.

64 Degrees.

25 Degrees.

Min	Sine.		Tang.		Secant.		
30	9.633984	9.955488	9.678496	10.321504	10.044512	10.366016	30
31	9.634249	9.955428	9.678821	10.321179	10.044572	10.365751	29
32	9.634514	9.955368	9.679146	10.320854	10.044632	10.365486	28
33	9.634776	9.955307	9.679471	10.320529	10.044693	10.365222	27
34	9.635042	9.955247	9.679795	10.320205	10.044753	10.364958	26
35	9.635306	9.955186	9.680126	10.319880	10.044814	10.364694	25
36	9.635670	9.955126	9.680444	10.319556	10.044874	10.364430	24
37	9.635833	9.955065	9.680768	10.319232	10.044935	10.364166	23
38	9.636097	9.955005	9.681092	10.318908	10.044995	10.363903	22
39	9.636360	9.954944	9.681416	10.318584	10.045056	10.363640	21
40	9.636623	9.954883	9.681740	10.318260	10.045117	10.363377	20
41	9.636886	9.954823	9.682063	10.317937	10.045177	10.363114	19
42	9.637148	9.954762	9.682386	10.317613	10.045238	10.362852	18
43	9.637411	9.954701	9.682710	10.317290	10.045299	10.362589	17
44	9.637673	9.954640	9.683033	10.316967	10.045359	10.362327	16
45	9.637935	9.954579	9.683356	10.316644	10.045421	10.362065	15
46	9.638197	9.954518	9.683678	10.316321	10.045482	10.361803	14
47	9.638458	9.954457	9.684001	10.315999	10.045543	10.361541	13
48	9.638720	9.954396	9.684324	10.315676	10.045604	10.361280	12
49	9.638981	9.954335	9.684646	10.315354	10.045665	10.361019	11
50	9.639242	9.954274	9.684968	10.315032	10.045726	10.360758	10
51	9.639503	9.954213	9.685290	10.314710	10.045787	10.360497	9
52	9.639764	9.954152	9.685612	10.314388	10.045848	10.360236	8
53	9.640024	9.954090	9.685934	10.314066	10.045910	10.359976	7
54	9.640284	9.954029	9.686255	10.313745	10.045971	10.359716	6
55	9.640544	9.953968	9.686577	10.313423	10.046032	10.359455	5
56	9.640804	9.953906	9.686898	10.313102	10.046094	10.359196	4
57	9.641064	9.953845	9.687219	10.312781	10.046155	10.358936	3
58	9.641323	9.953783	9.687540	10.312460	10.046217	10.358676	2
59	9.641583	9.953721	9.687861	10.312139	10.046278	10.358417	1
60	9.641842	9.953660	9.688182	10.311818	10.046340	10.358158	0
		Sine.		Tang.		Secant.	Min.

64 Degrees.

A Table of Artificial Sines,

26 *Degrees.*

Min.	Sine.		Tang.		Secant.		
0	9.641842	9.953660	9.688182	10.311818	10.046340	10.358158	60
1	9.642101	9.953598	9.688502	10.311498	10.046401	10.357899	59
2	9.642360	9.953537	9.688823	10.311177	10.046463	10.357640	58
3	9.642618	9.953475	9.689143	10.310857	10.046525	10.357382	57
4	9.642876	9.953413	9.689463	10.310537	10.046587	10.357123	56
5	9.643135	9.953351	9.689783	10.310217	10.046648	10.356865	55
6	9.643393	9.953290	9.690103	10.309897	10.046710	10.356607	54
7	9.643650	9.953228	9.690423	10.309575	10.046772	10.356350	53
8	9.643908	9.953166	9.690742	10.309258	10.046834	10.356092	52
9	9.644165	9.953104	9.691062	10.308938	10.046896	10.355835	51
10	9.644423	9.953042	9.691381	10.308619	10.046958	10.355577	50
11	9.644680	9.952980	9.691700	10.308300	10.047020	10.355320	49
12	9.644936	9.952917	9.692019	10.307981	10.047082	10.355063	48
13	9.645193	9.952855	9.692338	10.307662	10.047145	10.354807	47
14	9.645450	9.952793	9.692656	10.307343	10.047207	10.354550	46
15	9.645706	9.952731	9.692975	10.307025	10.047269	10.354294	45
16	9.645962	9.952668	9.693293	10.306707	16.047331	10.354038	44
17	9.646218	9.952606	9.693612	10.306388	10.047394	10.353782	43
18	9.646473	9.952544	9.693930	10.306070	10.047456	10.353526	42
19	9.646729	9.952481	9.694248	10.305752	10.047519	10.353271	41
20	9.646984	9.952419	9.694566	10.305434	10.047581	10.353016	40
21	9.647239	9.952356	9.694883	10.305117	10.047644	10.352760	39
22	9.647494	9.952294	9.695201	10.304799	10.047706	10.352505	38
23	9.647749	9.952231	9.695518	10.304482	10.047769	10.352251	37
24	9.648004	9.952168	9.695835	10.304164	10.047832	10.351996	36
25	9.648258	9.952105	9.696153	10.303847	10.047894	10.351742	35
26	9.648512	9.952043	9.696470	10.303530	10.047957	10.351488	34
27	9.648766	9.951980	9.696786	10.303213	10.048020	10.351233	33
28	9.649020	9.951917	9.697103	10.302897	10.048083	10.350980	32
29	9.649274	9.951854	9.697420	10 302580	10.048146	10.350726	31
30	9.649527	9 951791	9.697736	10.302264	10.048209	10.350473	30
		Sine.		Tang.		Secant.	Min.

63 *Degrees.*

26 *Degrees.*

Min.	Sine.		Tang.		Secaht.	
30	9.649527	9.951791	9.697736	10.302264	10.048209	10.350473
31	9.649781	9.951728	9.698053	10.301947	10.048272	10.350219
32	9.650034	9.951665	9.698369	10.301631	10.048335	10.349966
33	9.650287	9.951602	9.698685	10.301315	10.048398	10.349713
34	9.650539	9.951539	9.699001	10.300999	10.048461	10.349460
35	9.650792	9.951476	9.699316	10.300684	10.048524	10.349208
36	9.651044	9.951412	9.699632	10.300368	10.048588	10.348956
37	9.651297	9.951349	9.699947	10.300053	10.048651	10.348703
38	9.651549	9.951286	9.700263	10.299737	10.048714	10.348451
39	9.651800	9.951222	9.700578	10.299422	10.048778	10.348200
40	9.652052	9.951159	9.700893	10.299107	10.048841	10.347948
41	9.652303	9.951096	9.701208	10.298792	10.048904	10.347696
42	9.652555	9.951032	9.701523	10.298477	10.048968	10.347445
43	9.652806	9.950968	9.701837	10.298163	10.049031	10.347194
44	9.653057	9.950905	9.702152	10.297848	10.049095	10.346943
45	9.653397	9.950841	9.702466	10.297534	10.049159	10.346692
46	9.653558	9.950777	9.702780	10.297215	10.049222	10.346442
47	9.653808	9.950714	9.703095	10.296905	10.049286	10.346192
48	9.654059	9.950650	9.703409	10.296591	10.049350	10.345941
49	9.654309	9.950586	9.703722	10.296277	10.049414	[illegible]45691
50	9.654558	9.950522	9.704036	10.295964	10.049478	10.345442
51	9.654808	9.950458	9.704350	10.295650	10.049542	10.345192
52	9.655057	9.950394	9.704663	10.295337	10.049606	10.344942
53	9.655307	9.950330	9.704976	10.295023	10.049670	10.344693
54	9.655556	9.950266	9.705290	10.294710	10.049734	10.344444
55	9.655805	9.950202	9.705603	10.294397	10.049798	10.344195
56	9.656054	9.950138	9.705916	10.294084	10.049862	10.343946
57	9.656302	9.950074	9.706228	10.293772	10.049926	10.343698
58	9.656550	9.950000	9.706541	10.293459	10.049990	10.343449
59	9.656799	9.959945	9.706853	10.293146	10.050055	10.343201
60	9.657042	9.959881	9.707166	10.292834	10.050119	10.342953
		Sine.		Tang.		Secant.

63 *Degrees.*

Google

A Table of Artificial Sines,

27 Degrees.

	Sine.		Tang.		Secant.		
0	9.657047	9.949881	9.707166	10.292834	10.050119	10.342953	60
1	9.657295	9.949816	9.707478	10.292522	10 050183	10.342705	59
2	9.657542	9.949752	9.707790	10.292210	10.050248	10.342458	58
3	9.657790	9.949688	9 708102	10.291898	10.050312	10.342210	57
4	9.658037	9.949623	9.708414	10.291586	10.050377	10.341963	56
5	9.658284	9.949558	9.708726	10.291274	10.050441	10.341716	55
6	9.658531	9.949494	9.709037	10.290963	10.050506	10.341469	54
7	9.658778	9.949429	9 709349	10.290651	10.050571	10.341222	53
8	9.659025	9.949364	9.709660	10.290340	10.050635	10.340975	52
9	9.659271	9.949300	9 709971	10.290029	10.050700	10.340729	51
10	9.659517	9.949235	9.710282	10.289718	10.050765	10.340483	50
11	9.659763	9.949170	9.710593	10.289407	10.050830	10.340237	49
12	9.660009	9.949105	9.710904	10.289096	10.050895	10.339991	48
13	9.660255	9.949040	9.711215	10.288785	10.050960	10.339745	47
14	9.660500	9.948975	9.711525	10.288475	10 051025	10.339499	46
15	9.660746	9.948910	9 711836	10.288164	10.051090	20.339254	45
16	9.660991	9.948845	9.712146	10.287854	10.051155	10.339009	44
17	9.661236	9 948780	9.712456	10.287544	10.051220	10.338764	43
18	9.661481	9.948715	9.712766	10.287234	10.051285	10.338519	42
19	9.66172[illegible]	[illegible]948649	9.713076	10.286924	10.051350	10.338274	41
20	9.661970	9.948584	9.713386	10.286614	10.051416	10.338030	40
21	9.662214	9.948519	9.713696	10.286304	10.051481	10.337785	39
22	9.662459	9.948453	9.714005	10.285995	10.051546	10.337541	38
23	9.662703	9.948388	9.714314	10.285685	10.051612	10.337297	37
24	9.662946	9.948323	9.714624	10.285376	10.051677	10.337054	36
25	9.663190	9.948257	9.714933	10.285067	10.051743	10.336810	35
26	9.663433	9.948192	9.715242	10.284758	10 051808	10.336566	34
27	9.663677	9 948126	9.715551	10.284449	10.051874	10.336323	33
28	9.663920	9 948060	9.715859	10.284140	10.051940	10.336080	32
29	9.664163	9 947995	9.716168	10.283832	10.052005	10.335837	31
30	9.664400	9.947929	9.716477	10.283523	10.052071	10.335594	30
		Sine.		Tang.		Secant.	Min.

62 Degrees.

27 *Degrees.*

Min.	Sine.		Tang.		Secant.		
30	9.664406	9.947929	9.716477	10.283523	10.052071	10.335594	30
31	9.664648	9.947863	9.716785	10.283215	10.052137	10.335352	29
32	9.664891	9.947797	9.717093	10.282907	10.052203	10.335109	28
33	9.665133	9.947731	9.717401	10.282599	10.052269	10.334867	27
34	9.665375	9.947665	9.717709	10.282291	10.052334	10.334625	26
35	9.665617	9.947599	9.718017	10.281983	10.052400	10.334383	25
36	9.665859	9.947533	9.718325	10.281675	10.052466	10.334141	24
37	9.666100	9.947467	9.718633	10.281367	10.052533	10.333900	23
38	9.666341	9.947401	9.718940	10.281060	10.052599	10.333658	22
39	9.666583	9.947335	9.719248	10.280752	10.652665	10.333417	21
40	9.666824	9.947269	9.719555	10.280445	10.052731	10.333176	20
41	9.667065	9.947203	9.719862	10.280138	10.052797	10.332935	19
42	9.667305	9.947136	9.720169	10.279831	10.052864	10.332695	18
43	9.667546	9.947070	9.720476	10.279524	10.052930	10.332454	17
44	9.667786	9.947004	9.720783	10.279217	10.052996	10.332214	16
45	9.668026	9.946937	9.721089	10.278911	10.053063	10.331973	15
46	9.668266	9.946871	9.721396	10.278604	10.053129	10.331733	14
47	9.668506	9.946804	9.721702	10.278298	10.053196	10.331494	13
48	9.668746	9.946738	9.722008	10.277991	10.053262	10.331254	12
49	9.668986	9.946671	9.722315	10.277685	10.053329	10.331014	11
50	9.669225	9.946604	9.722621	10.277379	10.053396	10.330775	10
51	9.669464	9.946538	9.722927	10.277073	10.053462	10.330536	9
52	9.669703	9.946471	9.723232	10.276768	10.053529	10.330297	8
53	9.669942	9.946404	9.723538	10.276462	10.053596	10.330058	7
54	9.670181	9.946337	9.723844	10.276156	10.053663	10.329819	6
55	9.670419	9.946270	9.724149	10.275851	10.053730	10.329581	5
56	9.670658	9.946203	9.724454	10.275546	10.053797	10.329342	4
57	9.670896	9.946136	9.724759	10.275240	10.053864	10.329104	3
58	9.671134	9.946069	9.725065	10.274935	10.053931	10.328866	2
59	9.671372	9.946002	9.725369	10.274630	10.053998	10.328628	1
60	9.671609	9.945935	9.725674	10.274326	10.054065	10.328391	0
		Sine.		Tang.		Secant.	Min.

62 *Degrees.*

A Table of Artificial Sines,

28 *Degrees.*

	Sine.		Tang.		Secant.		
0	9.671609	9.945935	9.725674	10.274326	10.054065	10.328391	60
1	9.671847	9.945868	9.725979	10.274021	10.054132	10.328153	59
2	9.672084	9.945800	9.726284	10.273716	10.054199	10.327916	58
3	9.672321	9.945733	9.726588	10.273412	10.054267	10.327679	57
4	9.672558	9.945666	9.726892	10.273107	10.054334	10.327442	56
5	9.672795	9.945598	9.727197	10.272803	10.054401	10.327205	55
6	9.673032	9.945531	9.727501	10.272499	10.054469	10.326968	54
7	9.673268	9.945464	9.727805	10.272195	10.054536	10.326732	53
8	9.673505	9.945396	9.728109	10.271891	10.054604	10.326495	52
9	9.673741	9.945328	9.728412	10.271588	10.054671	10.326259	51
0	9.673977	9.945261	9.728716	10.271284	10.054739	10.326023	50
1	9.674213	9.945193	9.729020	10.270980	10.054807	10.325787	49
2	9.674448	9.945125	9.729323	10.270677	10.054874	10.325551	48
3	9.674684	9.945058	9.729626	10.270374	10.054942	10.325316	47
4	9.674919	9.944990	9.729929	10.270070	10.055010	10.325081	46
5	9.675155	9.944922	9.730232	10.269767	10.055078	10.324845	45
6	9.675390	9.944854	9.730535	10.269465	10.055146	10.324610	44
7	9.675624	9.944786	9.730838	10.269162	10.055214	10.324376	43
8	9.675859	9.944718	9.731141	10.268859	10.055282	10.324141	42
9	9.676094	9.944650	9.731444	10.268556	10.055350	10.323906	41
0	9.676328	9.944582	9.731746	10.268254	10.055418	10.323672	40
1	9.676562	9.944514	9.732048	10.267952	10.055486	10.323438	39
2	9.676796	9.944446	9.732351	10.267649	10.055554	10.323204	38
3	9.677030	9.944377	9.732653	10.267347	10.055623	10.322970	37
4	9.677264	9.944309	9.732955	10.267045	10.055691	10.322736	36
5	9.677497	9.944241	9.733257	10.266743	10.055759	10.322502	35
6	9.677731	9.944172	9.733558	10.266442	10.055827	10.322269	34
7	9.677964	9.944104	9.733860	10.266140	10.055896	10.322036	33
8	9.678197	9.944036	9.734162	10.265838	10.055964	10.321803	32
9	9.678430	9.943967	9.734463	10.265537	10.056033	10.321570	31
0	9.678663	9.943898	9.734764	10.265236	10.056101	10.321337	30
		Sine.		Tang.		Secant.	Min

61 *Degrees.*

28 *Degrees.*

Sine.		Tang.		Secant.	
9.678663	9.943898	9.734764	10.265236	10.056101	10.321337
9.678895	9.943830	9.735066	10.264934	10.056170	10.321104
9.679128	9.943761	9.735367	10.264633	10.056239	10.320872
9.679360	9.943692	9.735668	10.264332	10.056307	10.320640
9.679592	9.943624	9.735968	10.264031	10.056376	10.320408
9.679824	9.943555	9.736269	10.263731	10.056445	10.320176
9.680056	9.943486	9.736570	10.263430	10.056514	10.319944
9.680288	9.943417	9.736870	10.263129	10.056583	10.319712
9.680519	9.943348	9.737171	10.262829	10.056652	10.319481
9.680750	9.943279	9.737471	10.262529	10.056721	10.319250
9.680982	9.943210	9.737771	10.262229	10.056790	10.319018
9.681213	9.943141	9.738071	10.261929	10.056859	10.318787
9.681443	9.943072	9.738371	10.261629	10.056928	10.318557
9.681674	9.943003	9.738671	10.261329	10.056997	10.318326
9.681905	9.942933	9.738971	10.261029	10.057066	10.318095
9.682135	9.942864	9.739271	10.260729	10.057136	10.317865
9.682365	9.942795	9.739570	10.260430	10.057205	10.317635
9.682595	9.942725	9.739870	10.260130	10.057274	10.317405
9.682825	9.942656	9.740169	10.259831	10.057344	10.317175
9.683055	9.942587	9.740468	10.259532	10.057413	10.316945
9.683284	9.942517	9.740767	10.259233	10.057483	10.316716
9.683514	9.942448	9.741066	10.258934	10.057552	10.316486
9.683743	9.942378	9.741365	10.258635	10.057622	10.316257
9.683972	9.942308	9.741664	10.258336	10.057692	10.316028
9.684201	9.942239	9.741962	10.258038	10.057761	10.315799
9.684430	9.942169	9.742261	10.257739	10.057831	10.315570
9.684658	9.942099	9.742559	10.257441	10.057901	10.315342
9.684887	9.942029	9.742858	10.257142	10.057971	10.315113
9.685115	9.941959	9.743156	10.256844	10.058041	10.314885
9.685343	9.941889	9.743454	10.256546	10.058111	10.314657
9.685571	9.941819	9.743752	10.256248	10.058181	10.314429
	Sine.		Tang.		Secant.

61 *Degrees.*

A Table of Artificial Sines,

29 *Degrees.*

Min.	Sine.		Tang.	,	Secant.		
0	9.685571	9.941819	9.743752	10.256248	10.058181	10.314429	60
1	9.685799	9.941749	9.744050	10.255950	10.058252	10.314201	59
2	9.686027	9.941679	9.744348	10.255652	10.058321	10.313973	58
3	9.686254	9.941609	9.744645	10.255355	10.058391	10.313746	57
4	9.686482	9.941539	9.744943	10.255057	10.058461	10.313518	56
5	9.686709	9.941468	9.745240	10.254760	10.058531	10.313291	55
6	9.686936	9.941398	9.745538	10.254462	10.058602	10.313064	
7	9.687163	9.941328	9.745835	10.254165	10.058672	10.312837	
8	9.687389	9.941257	9.746132	10.253868	10.058742	10.312610	
9	9.687616	9.941187	9.746429	10.253571	10.058813	10.312384	
10	9.687842	9.941117	9.746726	10.253274	10.058883	10.312157	
11	9.688069	9.941046	9.747023	10.252977	10.058954	10.311931	
12	9.688295	9.940975	9.747319	10.252681	10.059024	10.311705	
13	9.688521	9.940905	9.747616	10.252384	10.059095	10.311479	
14	9.688747	9.940834	9.747912	10.252087	10.059166	10.311253	
15	9.688972	9.940763	9.748209	10.251791	10.059237	10.313028	
16	9.689198	9.940693	9.748505	10.251495	10.059307	10.310802	
17	9.689423	9.940622	9.748801	10.251199	10.059378	10.310577	
18	9.689648	9.940551	9.749097	10.250903	10.059449	10.310352	
19	9.689873	9.940480	9.749393	10.250607	10.059520	10.310127	
20	9.690098	9.940409	9.749689	10.250311	10.059591	10.309902	
21	9.690323	9.940338	9.749965	10.250015	10.059662	10.309677	
22	9.690548	9.940267	9.750281	10.249719	10.059733	10.309452	
23	9.690772	9.940196	9.750576	10.249424	10.059804	10.309228	
24	9.690996	9.940125	9.750872	10.249128	10.059875	10.309004	
25	9.691220	9.940053	9.751167	10.248833	10.059946	10.308779	
26	9.691444	9.939982	9.751462	10.248538	10.060016	10.308555	
27	9.691668	9.939911	9.751757	10.248243	10.060089	10.308332	
28	9.691892	9.939840	9.752052	10.247948	10.060160	10.308108	
29	9.692115	9.939768	9.752347	10.247653	10.060232	10.307884	
30	9.692339	9.939697	9.752642	10.247358	10.060303	10.307661	
		Sine.		Tang.		Secant.	

60 *Degrees.*

29 Degrees.

Sine.		Tang.		Secant.		
9.692339	9.939697	9.752642	10.247358	10.060303	10.307661	3
9.692562	9.939625	9.752937	10.247063	10.060375	10.307348	2
9.692785	9.939554	9.753231	10.246769	10.060446	10.307215	2
9.693009	9.939482	9.753526	10.246474	10.060518	10.306991	2
9.693231	9.939410	9.753820	10.246180	10.060589	10.306769	2
9.693453	9.939339	9.754115	10.245885	10.060661	10.306547	2
9.693676	9.939267	9.754409	10.245591	10.060733	10.306324	2
9.693898	9.939190	9.754703	10.245297	10.060805	10.306102	2
9.694120	9.939123	9.754997	10.245003	10.060877	10.305889	2
9.694342	9.939051	9.755291	10.244709	10.060948	10.305658	2
9.694564	9.938980	9.755585	10.244415	10.061020	10.305436	2
9.694786	9.938908	9.755878	10.244122	10.061092	10.305214	1
9.695007	9.938836	9.756172	10.243828	10.061164	10.304993	1
9.695229	9.938763	9.756465	10.243535	10.061236	10.304771	1
9.695450	9.938691	9.756759	10.243241	10.061309	10.304550	1
9.695671	9.938619	9.757052	10.242948	10.061381	10.304329	1
9.695892	9.938547	9.757345	10.242655	10.061453	10.304108	1
9.696113	9.938475	9.757638	10.242362	10.061525	10.303887	1
9.696334	9.938402	9.757931	10.242069	10.061598	10.303666	1
9.696554	9.938330	9.758224	10.241776	10.061670	10.303446	1
9.696774	9.938258	9.758517	10.241483	10.061742	10.303225	1
9.696995	9.938185	9.758810	10.241190	10.061815	10.303005	
9.697215	9.938113	9.759012	10.240898	10.061887	10.302785	
9.697435	9.938040	9.759395	10.240605	10.061960	10.302565	
9.697654	9.937967	9.759687	10.240313	10.062033	10.302345	
9.697874	9.937895	9.759979	10.240021	10.062105	10.302126	
9.698094	9.937822	9.760272	10.239728	10.062178	10.301906	
9.698313	9.937749	9.760564	10.239436	10.062251	10.301687	
9.698532	9.937676	9.760856	10.239144	10.062324	10.301468	
9.698751	9.937603	9.761148	10.238852	10.062396	10.301249	
9.698970	9.937531	9.761439	10.238561	10.062469	10.301030	
	Sine.		Tang.		Secant.	Min.

60 Degrees.

A Table of Artificial Sines,

30 *Degrees.*

Min.	Sine.		Tang.		Secant.		
0	9.698970	9.937531	9.761439	10.238561	10.062469	10.301030	60
1	9.699189	9.937458	9.761731	10.238269	10.062543	10.300811	59
2	9.699407	9.937385	9.762023	10.237977	10.062615	10.300593	58
3	9.699626	9.937312	9.762314	10.237686	10.062688	10.300374	57
4	9.699844	9.937238	9.762606	10.237394	10.062761	10.300156	56
5	9.700062	9.937165	9.762897	10.237103	10.062835	10.299938	55
6	9.700280	9.937092	9.763188	10.236812	10.062908	10.299720	54
7	9.700498	9.937019	9.763479	10.236521	10.062981	10.299502	53
8	9.700716	9.936946	9.763770	10.236230	10.063054	10.299284	52
9	9.700933	9.936872	9.764061	10.235939	10.063128	10.299067	51
10	9.701151	9.936799	9.764352	10.235648	10.063201	10.298849	50
11	9.701368	9.936725	9.764643	10.235357	10.063275	10.298632	49
12	9.701585	9.936652	9.764933	10.235067	10.063348	10.298415	48
13	9.701802	9.936578	9.765224	10.234776	10.063422	10.298198	47
14	9.702019	9.936505	9.765514	10.234486	10.063495	10.297981	46
15	9.702236	9.936431	9.765805	10.234195	10.063569	10.297764	45
16	9.702452	9.936357	9.766095	10.233905	10.063643	10.297548	44
17	9.702669	9.936284	9.766385	10.233615	10.063716	10.297334	43
18	9.702885	9.936210	9.766675	10.233325	10.063790	10.297115	42
19	9.703101	9.936136	9.766965	10.233035	10.063864	10.196899	41
20	9.703317	9.936062	9.767255	10.232745	10.063938	10.296683	40
21	9.703533	9.935988	9.767545	10.232455	10.064012	10.296467	39
22	9.703749	9.935914	9.767834	10.232166	10.064086	10.296251	38
23	9.703964	9.935840	9.768124	10.231876	10.064160	10.296036	37
24	9.704179	9.935766	9.768413	10.231586	10.064234	10.295820	36
25	9.704395	9.935692	9.768703	10.231297	10.064308	10.295605	35
26	9.704610	9.935618	9.768992	10.231008	10.064382	10.295390	34
27	9.704825	9.935543	9.769281	10.230719	10.064457	10.295175	33
28	9.705040	9.935469	9.769570	10.230429	10.064531	10.294960	32
29	9.705254	9.935395	9.769860	10.230140	10.064605	10.294746	31
30	9.705469	9.935320	9.770148	10.229851	10.064680	10.294531	3
		Sine.		Tang.		Secant.	

59 *Degrees.*

30 *Degrees.*

	Sine.		Tang.		Secant.		
0	9.705469	9.935320	9.779148	10.229851	10.064680	10.294531	3
1	9.705683	9.935246	9.770437	10.229563	10.064754	10.294317	2
2	9.705897	9.935171	9.770726	10.229274	10.064828	10.294102	2
3	9.706112	9.935097	9.771015	10.228985	10.064903	10.293888	2
4	9.706326	9.935022	9.771303	10.228697	10 064978	10.293674	2
5	9.706539	9.934948	9.771592	10.228408	10.065052	10.293461	2
	9.506753	9.934873	9.771880	10.228120	10.065127	10.293247	2
7	9.706967	9.934798	9.772168	10.227832	10.065202	10.293033	2
	9.707180	9.934723	9.772457	10.227543	10.065276	10.292820	2
	9.707393	9.934649	9.772745	10.227255	10.065351	10.292607	2
	9.707606	9.934574	9.773033	10.226967	10.065426	10.292393	2
	9.707819	9.934499	9.773321	10.226679	10.065501	10.292181	1
	9.708032	9.934424	9.773608	10.226392	10.065576	10.291968	1
	9.708245	9 934349	9.773896	10.226104	10.065651	10.291755	1
	9.708457	9.934274	9.774184	10.225816	10.065726	10.291542	1
	9.708670	9.934199	9.774471	10.225529	10.065801	10.291330	1
	9.708882	9.934123	9.774759	10.225241	10.065877	10.291118	1
	9 709094	9 934048	9.775046	10.224954	10.065952	10.290906	1
	9.709306	9.933973	9.775333	10.224667	10.066027	10.290694	1
	9.709518	9.933898	9.775621	10.224379	10.066102	10.290482	1
	9.709730	9.933822	9.775908	10.224092	10.066178	10.290270	1
	9.709941	9.933747	9.776195	10.223805	10.066253	10.290058	9
	9.710153	9.933671	9.776482	10.223518	10.066329	10.289847	8
	9.710364	9.933596	9.776768	10.223231	10.066404	10.289636	7
	9.710575	9 933520	9.777055	10.222945	10.066480	10.289425	6
	9.710786	9 933444	9.777342	10.222658	10.066555	10.289214	5
	9.710997	9.933369	9.777628	10.222372	10.066631	10.289003	4
	9.711208	9 933293	9.777915	10.222085	10.066707	10.288792	3
	9.711419	9 933217	9.778201	10.221799	10.066783	10.288581	2
	9.711629	9.933141	9.778487	10.221512	10.066858	10.288371	1
	9.711839	9 933066	9.778774	10.221226	10 066934	10.288161	0
		Sine.				Secant.	Min.

59 *Degrees.*

A Table of Artificial Sines,

31 *Degrees.*

Min.	Sine.		Tang.		Secant.		
0	9.711839	9.933066	9.778774	10.221226	10.066934	10.288161	60
1	9.712049	9.932990	9.779060	10.220940	10.067010	10.287950	59
2	9.712260	9.932914	9.779346	10.220654	10.067086	10.287740	58
3	9.712469	9.932838	9.779632	10.220368	10.067162	10.287530	57
4	9.712679	9.932762	9.779918	10.220082	10.067268	10.287321	56
5	9.712889	9.932685	9.780203	10.219797	10.067315	10.287111	55
6	9.713098	9.932609	9.780489	10.219511	10.067391	10.286902	54
7	9.713308	9.932533	9.780775	10.219225	10.067467	10.286692	53
8	9.713517	9.932457	9.781060	10.218940	10.067543	10.286483	52
9	9.713726	9.932380	9.781346	10.218654	10.067620	10.286274	51
10	9.713935	9.932304	9.781631	10.218369	10.067696	10.286065	50
11	9.714144	9.932228	9.781916	10.218084	10.067772	10.285856	49
12	9.714352	9.932151	9.782201	10.217799	10.067849	10.285648	48
13	9.714561	9.932075	9.782486	10.217514	10.067925	10.285439	47
14	9.714769	9.931998	9.782771	10.217229	10.068002	10.285231	46
15	9.714978	9.931921	9.783056	10.216945	10.068079	10.285022	45
16	9.715186	9.931845	9.783341	10.216660	10.068155	10.284814	44
17	9.715394	9.931768	9.783626	10.216374	10.068232	10.284606	43
18	9.715601	9.931691	9.783910	10.216090	10.068309	10.284398	42
19	9.715809	9.931614	9.784195	10.215805	10.068386	10.284191	41
20	9.716017	9.931537	9.784479	10.215521	10.068463	10.283983	40
21	9.716224	9.931460	9.784794	10.215236	10.068539	10.283776	39
22	9.716432	9.931383	9.785048	10.214952	10.068616	10.283568	38
23	9.716630	9.931306	9.785332	10.214668	10.068693	10.283361	37
24	9.716846	9.931229	9.785616	10.214384	10.068771	10.283154	36
25	9.717053	9.931152	9.785900	10.214100	10.068848	10.282947	
26	9.717259	9.931075	9.786184	10.213816	10.068925	10.282741	
27	9.717466	9.930998	9.786468	10.213532	10.069002	10.282534	
28	9.717672	9.930920	9.786752	10.213248	10.069079	10.282327	
29	9.717879	9.930843	9.787036	10.212964	10.069157	10.282121	31
30	9.718085	9.930766	9.787319	10.212681	10.069234	10.281915	30
		Sine.		Tang.		Secant.	Min.

58 *Degrees.*

31 Degrees.

Min.	Sine.		Tang.		Secant.		
30	9.718085	9.930766	9.787319	10.212681	10.069234	10.281915	3
31	9.718291	9.930688	9.787603	10.212397	10.069312	10.281709	2
32	9.718497	9.930611	9.787886	10.212114	10.069389	10.281503	2
33	9.718703	9.930533	9.788170	10.211830	10.069467	10.281297	2
34	9.718909	9.930456	9.788453	10.211547	10.069544	10.281091	2
35	9.719114	9.930378	9.788736	10.211264	10.069622	10.280886	2
36	9.719320	9.930300	9.789019	10.210981	10.069700	10.280680	2
37	9.719525	9.930223	9.789302	10.210698	10.069777	10.280475	2
38	9.719730	9.930145	9.789585	10.210415	10.069855	10.280270	2
39	9.719935	9.930067	9.789868	10.210132	10.069933	10.280065	2
40	9.720140	9.929989	9.790151	10.209849	10.070011	10.279860	2
41	9.720345	9.929911	9.790433	10.209566	10.070089	10.279655	1
42	9.720549	9.929833	9.790716	10.209284	10.070167	10.279451	1
43	9.720754	9.929755	9.790999	10.209001	10.070245	10.279246	1
44	9.720958	9.929677	9.791281	10.208719	10.070323	10.279042	1
45	9.721162	9.929599	9.791563	10.208436	10.070401	10.278838	1
46	9.721366	9.929521	9.791846	10.208154	10.070479	10.278634	1
47	9.721570	9.929442	9.792128	10.207872	10.070558	10.278430	1
48	9.721774	9.929364	9.792410	10.207590	10.070636	10.278226	1
49	9.721978	9.929286	9.792692	10.207308	10.070714	10.278022	1
50	9.722181	9.929207	9.792974	10.207026	10.070793	10.277819	1
51	9.722385	9.929129	9.793256	10.206744	10.070871	10.277615	9
52	9.722588	9.929050	9.793538	10.206462	10.070950	10.277412	8
53	9.722791	9.928972	9.793819	10.206180	10.071028	10.277209	7
54	9.722994	9.928893	9.794101	10.205899	10.071107	10.277006	6
55	9.723197	9.928814	9.794383	10.205617	10.071185	10.276805	5
56	9.723400	9.928736	9.794664	10.205336	10.071264	10.276603	4
57	9.723603	9.928657	9.794945	10.205054	10.071343	10.276397	3
58	9.723805	9.928578	9.795227	10.204773	10.071422	10.276195	2
59	9.724007	9.928499	9.795508	10.204492	10.071501	10.275992	1
60	9.724210	9.928420	9.795789	10.204211	10.071579	10.275790	0
		Sine.		Tang.		Secant.	Min.

58 Degrees.

A Table of Artificial Sines,

32 *Degrees.*

Min.	Sine.		Tang.		Secant.		
0	9.724210	9.928420	9.795789	10.204211	10.071579	10.275790	60
1	9.724412	9.928341	9.796070	10.203930	10.071658	10.275588	59
2	9.724614	9.928262	9.796351	10.203649	10.071737	10.275380	58
3	9.724816	9.928183	9.796632	10.203368	10.071817	10.275184	57
4	9.725017	9.928104	9.796913	10.203087	10.071896	10.274983	56
5	9.725219	9.928025	9.797194	10.202806	10.071975	10.274781	55
6	9.725420	9.927946	9.797474	10.202525	10.072054	10.274580	54
7	9.725622	9.927867	9.797755	10.202245	10.072133	10.274378	53
8	9.725823	9.927787	9.798036	10.201964	10.072213	10.274177	52
9	9.726024	9.927704	9.798316	10.201684	10.072292	10.273976	51
10	9.726225	9.927628	9.798596	10.201404	10.072371	10.273775	50
11	9.726426	9.927549	9.798877	10.201123	10.072451	10.273574	49
12	9.726626	9.927469	9.799157	10.200843	10.072530	10.273374	48
13	9.726827	9.927390	9.799437	10.200563	10.072610	10.273173	47
14	9.727027	9.927310	9.799717	10.200283	10.072690	10.272973	46
15	9.727228	9.927231	9.799997	10.200003	10.072769	10.272772	45
16	9.727428	9.927151	9.800277	10.199723	10.072849	10.272572	44
17	9.727628	9.927071	9.800557	10.199443	10.072929	10.272372	43
18	9.727828	9.926991	9.800836	10.199163	10.073009	10.272172	42
19	9.728027	9.926911	9.801116	10.198884	10.073089	10.271972	41
20	9.728227	9.926831	9.801396	10.198604	10.073169	10.271773	40
21	9.728427	9.926751	9.801675	10.198325	10.073249	10.271573	39
22	9.728626	9.926671	9.801955	10.198045	10.073329	10.271374	38
23	9.728825	9.926591	9.802234	10.197766	10.073409	10.271175	37
24	9.729024	9.926511	9.802513	10.197487	10.073489	10.270976	36
25	9.729223	9.926431	9.802792	10.197207	10.073569	10.270777	35
26	9.729422	9.926351	9.803072	10.196928	10.073649	10.270578	34
27	9.729621	9.926270	9.803351	10.196649	10.073730	10.270379	33
28	9.729820	9.926190	9.803630	10.196370	10.073810	10.270180	32
29	9.730018	9.926110	9.803908	10.196091	10.073891	10.269982	31
30	9.730216	9.926029	9.804187	10.195813	10.073971	10.269783	30
		Sine.		Tang.		Secant.	Min.

57 *Degrees.*

Tangents and Secants.

32 *Degrees.*

Min.	Sine.		Tang.		Secant.		
30	9.730216	9.926029	9.804187	10.195813	10.073971	10.269783	30
31	9.730415	9.925949	9.804466	10.195534	10.074051	10.269585	29
32	9.730613	9.925868	9.804745	10.195255	10.074132	10.269387	28
33	9.730811	9.925787	9.805023	10.194977	10.014212	10.269189	27
34	9.731009	9.925707	9.805302	10.194698	10.074293	10.268991	26
35	9.731206	9.925626	9.805580	10.194420	10.074374	10.268794	25
36	9.751404	9.925545	9.805859	10.194141	10.074455	10.268596	24
37	9.731601	9.925465	9.806137	10.193863	10.074535	10.268398	23
38	9.731799	9.925384	9.806415	10.193585	10.074616	10.268201	22
39	9.731996	9.925303	9.806693	10.193307	10.074697	10.268004	21
40	9.732193	9.925222	9.806971	10.193029	10.074778	10.267807	20
41	9.732390	9.925141	9.807249	10.192751	10.074859	10.267601	19
42	9.732587	9.925051	9.807527	10.192473	10.074940	10.267413	18
43	9.732784	9.924979	9.807805	10.192195	10.075021	10.267216	17
44	9.732980	9.924897	9.808083	10.191917	10.075103	10.267020	16
45	9.733177	9.924816	9.808361	10.191639	10.075184	10.266823	15
46	9.733373	9.924735	9.808638	10.191362	10.075265	10.266627	14
47	9.733569	9.924653	9.808916	10.191084	10.075346	10.266431	13
48	9.733765	9.924572	9.809193	10.190807	10.075428	10.266235	12
49	9.733961	9.924491	9.809471	10.190529	10.075509	10.266039	11
50	9.734157	9.924409	9.809748	10.190252	10.075591	10.265843	10
51	9.734353	9.924328	9.810025	10.189975	10.075672	10.265647	9
52	9.734548	9.924246	9.810302	10.189699	10.075754	10.265451	8
53	9.734744	9.924164	9.810580	10.189420	10.075836	10.265256	7
54	9.734939	9.924083	9.810587	10.189143	10.075917	10.265061	6
55	9.735134	9.924011	9.811134	10.188866	10.075999	10.264865	5
56	9.735330	9.923919	9.811410	10.188589	10.076080	10.264670	4
57	9.735525	9.923837	9.811687	10.188313	10.076163	10.264475	3
58	9.735719	9.923755	9.811964	10.188036	10.076245	10.264280	2
59	9.735914	9.923673	9.812241	10.187759	10.076327	10.264086	1
60	9.736109	9.923591	9.812517	10.187483	10.076409	10.263891	0
		Sine.		Tang.		Secant.	Min.

57 *Degrees.*

A Table of Artificial Sines,

34 *Degrees.*

Min.	Sine.		Tang.		Secant.		
0	9.747562	9.918574	9.828987	10.171013	10.081426	10.252438	60
1	9.747749	9.918489	9.829260	10.170740	10.081511	10.252251	59
2	9.747936	9.918404	9.829532	10.170468	10.081596	10.252064	58
3	9.748123	9.918318	9.829805	10.170195	10.081682	10.251877	57
4	9.748310	9.918233	9.830077	10.169923	10.081767	10.251690	56
5	9.748497	9.918147	9.830349	10.169651	10.081852	10.251503	55
6	9.748683	9.918062	9.830621	10.169379	10.081938	10.251317	54
7	9.748870	9.917976	9.830893	10.169107	10.082024	10.251130	53
8	9.749056	9.917891	9.831165	10.168835	10.082109	10.250944	52
9	9.749242	9.917805	9.831437	10.168563	10.082195	10.250757	51
10	9.749429	9.917719	9.831709	10.168291	10.082281	10.250571	50
11	9.749615	9.917634	9.831981	10.168019	10.082366	10.250385	49
12	9.749801	9.917548	9.832253	10.167747	10.082452	10.250199	48
13	9.749987	9.917462	9.832525	10.167475	10.082538	10.250013	47
14	9.750172	9.917376	9.832796	10.167204	10.082624	10.249828	46
15	9.750358	9.917290	9.833068	10.166932	10.082710	10.249642	45
16	9.750543	9.917204	9.833339	10.166661	10.082796	10.249457	44
17	9.750729	9.917118	9.833611	10.166389	10.082882	10.249271	43
18	9.750914	9.917032	9.833882	10.166118	10.082968	10.249806	42
19	9.751099	9.916945	9.834154	10.165846	10.083054	10.248901	41
20	9.751284	9.916859	9.834425	10.165575	10.083141	10.248716	40
21	9.751469	9.916773	9.834696	10.165304	10.08322	10.248531	39
22	9.751654	9.916687	9.834967	10.165033	10.083313	10.248346	
23	9.751838	9.916600	9.835238	10.164762	10.083400	10.248161	37
24	9.752023	9.916514	9.835509	10.164491	10.083486	10.247977	
25	9.752207	9.916427	9.835780	10.164220	10.083573	10.247792	
26	9.752392	9.916341	9.836051	10.163949	10.083659	10.247608	
27	9.752576	9.916254	9.836322	10.163678	10.083746	10.247424	
28	9.752760	9.916167	9.836593	10.163407	10.083833	10.247241	
29	9.752944	9.916080	9.836864	10.163136	10.083919	10.24705	
30	9.753128	9.915994	9.837134	10.162866	10.08400	10.24687	
		Sine.		Tang.		Secant.	

55 *Degrees.*

34 *Degrees.*

Min.	Sine.		Tang.		Secant.		
30	9.753128	9.915994	9.837134	10.162866	10.084006	10.246872	30
31	9.753312	9.915907	9.837405	10.162595	10.084093	10.246688	29
32	9.753495	9.915820	9.837675	10.162324	10.084180	10.246505	28
33	9.753679	9.915733	9.837946	10.162054	10.084267	10.246321	27
34	9.753862	9.915646	9.838216	10.161784	10.084354	10.246138	26
35	9.754046	9.915559	9.838487	10.161513	10.084441	10.245954	25
36	9.754229	9.915472	9.838757	10.161243	10.084528	10.245771	24
37	9.754412	9.915385	9.839027	10.160973	10.084615	10.245588	23
38	9.754595	9.915297	9.839297	10.160702	10.084703	10.245405	22
39	9.754778	9.915210	9.839568	10.160432	10.084790	10.245222	21
40	9.754960	9.915123	9.839838	10.160162	10.084877	10.245040	20
41	9.755143	9.915035	9.840108	10.159892	10.084965	10.244857	19
42	9.755326	9.914948	9.840378	10.159622	10.085052	10.244674	18
43	9.755508	9.914860	9.840647	10.159352	10.085140	10.244492	17
44	9.755690	9.914773	9.840917	10.159083	10.085227	10.244310	16
45	9.755872	9.914685	9.841187	10.158813	10.085315	10.244128	15
46	9.756054	9.914598	9.841457	10.158543	10.085402	10.243940	14
47	9.756236	9.914510	9.841726	10.158273	10.085490	10.243764	13
48	9.756418	9.914422	9.841996	10.158004	10.085578	10.243582	12
49	9.756600	9.914334	9.842266	10.157734	10.085666	10.243400	11
50	9.756781	9.914246	9.842535	10.157465	10.085754	10.243218	10
51	9.756963	9.914158	9.842805	10.157195	10.085842	10.243037	9
52	9.757144	9.914070	9.843074	10.156926	10.085930	10.242856	8
53	9.757326	9.913982	9.843343	10.156657	10.086018	10.242674	7
54	9.757507	9.913894	9.843612	10.156388	10.086106	10.242493	6
55	9.757688	9.913806	9.843882	10.156118	10.086194	10.242312	5
56	9.757869	9.913718	9.844151	10.155849	10.086282	10.242131	4
57	9.758049	9.913630	9.844420	10.155580	10.086370	10.241950	3
58	9.758230	9.913541	9.844689	10.155311	10.086459	10.241770	2
59	9.758411	9.913453	9.844958	10.155042	10.086547	10.241589	1
60	9.758591	9.913364	9.845227	10.154773	10.086635	10.241409	0
		Sine.		Tang.		Secant.	Min.

55 *Degrees.*

A Table of Artificial Sines,

35 *Degrees.*

Min	Sine.		Tang.		Secant.		
0	9.758591	9.913364	9.845227	10 154773	10.086653	10.241409	60
1	9.758772	9.913276	9.845496	10.154504	10.086724	10.241228	59
2	9.758952	9.913187	9.845764	10.154236	10.086812	10.241048	58
3	9.759132	9 913099	9.846033	10.153967	10.086901	10.240868	57
4	9.759312	9.913010	9.846302	10.153698	10.086990	10.240688	56
5	9.759492	9.912921	9.846570	10.153429	10.087078	10.240508	55
6	9 759672	9.912833	9.846839	10.153161	10.087167	10.240328	54
7	9.759851	9.912744	9.847107	10.152892	10.087256	10.240148	53
8	9.760031	9.912655	9.847376	10.152624	10.087345	10.239969	52
9	9.760211	9.912566	9.847644	10 152356	10.087434	10 239789	51
0	6.760390	9.912477	9.847913	10.152087	10 087523	10.239610	50
1	9.760569	9.912388	9.848181	10.151819	10.087612	10.239431	49
2	9.760748	9.912299	9 848449	10.151551	10.087701	10.239252	48
3	9 760927	9.912210	9.848717	10.151283	10.087790	10.239073	47
4	9 761106	9.912121	9.848985	10.151014	10.087879	10 23889	46
5	9.761285	9 912031	9.849254	10.150746	10.087968	10.238715	45
6	9.761464	9.911942	9.849522	10.150478	10.088058	10.238536	44
7	9.761642	9 911853	9.849790	10.150210	10.088147	10.338358	43
8	9.761821	9.911763	9.840057	10.149942	10.088237	10.238179	42
9	9.761999	9.911674	9.850325	10.149675	10.088326	10.238001	41
0	9.762177	9.311584	9.850593	10.149407	10.088416	10.237822	40
1	9.762356	9.911495	9.850861	10.149139	10 088505	10.237644	39
2	9.762534	9.911405	9.851128	10.148871	10.088595	10.237466	38
3	9.762712	9.911315	9.851396	10.148604	10.088684	10.237288	37
4	9.762889	9 911226	9.851664	10.148336	10 088774	10.237111	36
5	9.763067	9.911136	9.851931	10.148069	10.088864	10.236933	35
6	9.763245	9 911046	9.852199	10.147801	10.088954	10.236755	34
7	9.763422	9.910956	9.852466	10.147534	10.089044	10.236578	33
8	9.763600	9.910866	9.852733	10.147266	10.089134	10.236400	32
9	9.763777	9.910776	9 853001	10.146999	10.089224	10.236223	31
0	9.763954	9.910686	9.853268	10.146732	10 089314	10.236046	30
		Sine.		Tang.		Secant.	Min.

54 *Degrees.*

35 *Degrees.*

Min.	Sine.		Tang.		Secant.	
30	9.763954	9.910686	9.853268	10.146732	10.089314	10.236046
31	9.764131	9.910596	9.853535	10.146465	10.089404	10.235869
32	9.764308	9.910506	9.853802	10.146198	10.089494	10.235692
33	9.764485	9.910415	9.854069	10.145931	10.089585	10.235515
34	9.764662	9 910325	9.854336	10.145664	10.089675	10.235338
35	9.764838	9.910235	9.854603	10.145397	10.089765	10.235162
36	9.765015	9.910144	9.854870	10.145130	10.089856	10.234985
37	9.765191	9.910054	9.855137	10.144863	10.089946	10.234809
38	9 765367	9.909963	9.855404	10.144596	10.090037	10.234633
39	9.765544	9.909873	9.855671	10.144329	10.090127	10.234456
40	9.765720	9.909782	9.855938	10.144062	10.090218	10.234280
41	9.765896	9.909691	9.856204	10.143796	10.090308	10.234104
42	9.766071	9.909601	9 856471	80.143529	10.090399	10.233928
43	9 766247	9 909510	9.856737	10.143263	10.090490	10.233753
44	9.766423	9.909419	9 857004	10.142996	10.090581	10.233577
45	9.766598	9.909328	9 857270	10.142730	10 090672	10.233401
46	9.766774	9.909237	9.857537	10.142463	10.090763	10.233226
47	9.766949	9.909146	9.857803	10 142197	10.090854	10.233051
48	9.767124	9.909055	9.858069	10.141931	10.090945	10.232876
49	9.767290	9.908964	9.858336	10.141664	10.091036	10.232700
50	9.767475	9.908873	9.858602	10.141398	10.091127	10.232525
51	9.767649	9.908781	9 858868	10.141132	10.091219	10.232351
52	9.767824	9.908691	9.859134	10.140866	10.091310	10.232176
53	9 767999	9.908599	9.859400	10.140600	10 091401	10.232001
54	9.768173	9.908507	9.859665	10 140334	10.091493	10.231826
55	9.768348	9.908416	9.859932	10.140068	10 091584	10 231652
56	9 768[illegible]2	9.908324	9 860198	10.139802	10.091676	10.231478
57	9.768597	9.908233	9.860464	10.139536	10.091767	10.231303
58	9.768871	9 908141	9.860730	10.139270	10 091855	10.231129
59	9.76904[illegible]	9.908049	9.860995	10.139005	10.091951	10.2309[illegible]5
60	9.769219	9.907958	9.861261	10.138739	10.092042	10.230781
		Sine.		Tang.		Secant.

54 *Degrees.*

A Table of Artificial Sines,

36 *Degrees.*

Min.	Sine.		Tang.		Secant.		
0	9.769219	9.907958	9.861261	10.138739	10.092042	10.230781	60
1	9.769392	9.907866	9.861527	10.138473	10.092134	10.230607	59
2	9.769566	9.907774	9.861792	10.138208	10.092226	10.230434	58
3	9.769740	9.907682	9.862058	10.137942	10.092318	10.230260	57
4	9.769913	9.907590	9.862323	10.137677	10.092410	10.230087	56
5	9.770087	9.907498	9.862589	10.137411	10.092502	10.229913	55
6	9.770260	9.907406	9.862854	10.137146	10.092594	10.229740	54
7	9.770433	9.907314	9.863119	10.136880	10.092686	10.229567	53
8	9.770606	9.907221	9.863385	10.136615	10.092778	10.229394	52
9	9.770779	9.907129	9.863650	10.136350	10.092871	10.229220	51
10	9.770952	9.907037	9 863915	10.136085	10.092963	10.229048	50
11	9.771125	9.906945	9.864180	10.135820	10.093055	10.228875	49
12	9.771298	9.906852	9.864445	10.135555	10.093148	10.228702	48
13	9.771470	9.906760	9.864710	10.135289	10.093240	10.228520	47
14	9.771642	9.906667	9.864975	10 135024	10.093333	10.228357	46
15	9.771815	9.906574	9.865240	10 134760	10.093425	10.228185	45
16	9.771987	9.906482	9.865505	10.134495	10.093518	10.228013	44
17	9.772159	9.906389	9 865770	10.134230	10 093611	10.227841	43
18	9.772331	9.906296	9.866035	10.133965	10.093704	10.227669	42
19	9.772503	9.906204	9.866300	10.133700	10.093796	10.227497	41
20	9.772675	9.906111	9.866564	10.133436	10.093889	10.227325	40
21	9.772847	9.906018	9.866829	10.133171	10.093982	10.227153	39
22	9.773018	9.905925	9.867094	10.132906	10.094075	10.226981	38
23	9.773190	9.905832	9.867358	10.132642	10.094168	10.226810	37
24	9.773361	9.905739	9 867623	10.132377	10 094261	10.226639	36
25	9.773533	9.905645	9.867887	10.132113	10.094355	10.226467	35
26	9.773704	9.905552	9.868152	10.131848	10.094448	10.226296	34
27	9.773875	9.905459	9.868416	10.131584	10.094541	10.226125	33
28	9.774046	9 905366	9.868680	10.131320	10.094634	10.225954	32
29	9.774217	9.905272	9.868945	10 131055	10.094728	10.225783	31
30	9.774388	9.905179	9.869209	10.130791	10.094821	10.225612	30
		Sine.		Tang.		Secant.	Min.

53 *Degrees.*

36 Degrees.

Min.	Sine.		Tang.		Secant.		
30	9.774388	9.905179	9.869209	10.130791	10.094821	10.225612	30
31	9.744558	9.905085	9.869473	10.130527	10.094915	10.225442	29
32	9.774729	9.904992	9.869737	10.130263	10.095008	10.225271	28
33	9.774899	9.904898	9.870001	10.129999	10.095102	10.225101	27
34	9.775070	9.904804	9.870265	10.129735	10.095196	10.224930	26
35	9.775240	9.904711	9.870529	10.129471	10.095289	10.224760	25
36	9.775410	9.904617	9.870793	10.129207	10.095383	10.224590	24
37	9.775580	9.904528	9.871057	10.128943	10.095477	10.224420	23
38	9.775750	9.904429	9.871321	10.128679	10.095571	00.224250	22
39	9.775920	9.904335	9.871585	10.128415	10.095665	10.224080	21
40	9.776090	9.904241	9.871849	10.128151	10.095759	10.223910	20
41	9.776259	9.904147	9.872112	10.127888	10.095853	10.223741	19
42	9.776429	9.904053	9.872376	10.127624	10.095947	10.223571	18
43	9.776598	9.903959	9.872640	10.127360	10.096041	10.223402	17
44	9.776768	9.903864	9.872903	10.127097	10.096136	10.223232	16
45	9.776937	9.903770	9.873167	10.126833	10.096230	10.223063	15
46	9.777106	9.903676	9.873430	10.126570	10.096324	10.222894	14
47	9.777275	9.903581	9.873694	10.126306	10.096419	10.222725	13
48	9.777444	9.903487	9.873957	10.126042	10.096513	10.222556	12
49	9.777613	9.903392	9.874220	10.125780	10.096608	10.222387	11
50	9.777781	9.903298	9.874484	10.225516	10.096703	10.222218	10
51	9.777950	9.903203	9.874747	10.125253	10.096797	10.222050	9
52	9.778119	9.903108	9.875010	10.124990	10.096892	10.221881	8
53	9.778287	9.903014	9.875273	10.124727	10.096986	10.221713	7
54	9.778455	9.902929	9.875536	10.124463	10.097081	10.221545	6
55	9.778623	9.902824	9.875800	10.124200	10.097176	10.221376	5
56	9.778792	9.902729	9.876063	10.123937	10.097271	10.221208	4
57	9.778960	9.902634	9.876326	10.123674	10.097366	10.221040	3
58	9.779128	9.902539	9.876589	10.123411	10.097461	10.220872	2
59	9.779295	9.902444	9.876851	10.123148	10.097556	10.220705	1
60	9.779463	9.902349	9.877114	10.122886	10.097651	10.220537	0
		Sine.		Tang.		Secant.	Min.

53 Degrees.

A Table of Artificial Sines,

37 *Degrees.*

Min.	Sine.		Tang.		Secant.		
0	9.779463	9.902349	9.877114	10.122886	10.097651	10.220537	60
1	9.779631	9.902253	9.877377	10.122623	10.097747	10.220369	59
2	9.779798	9.902158	9 877640	10.122360	10.097842	10.220202	58
3	9.779965	9.902063	9.877903	10.122097	10.097937	10.220034	57
4	9.780133	9.901967	9.878165	10.121835	10.098033	10.219867	56
5	9.780300	9.901872	9.878428	10.121572	10.098128	10.219700	55
6	9.780467	9.901776	9.878691	10.121309	10.098224	10.219533	54
7	9.780634	9.901681	9.878953	10.121047	10.098319	10.219366	53
8	9.780801	9.901585	9.879216	10.120784	10.098415	10.219199	52
9	9.780968	9.901489	9.879478	10.120522	10.098510	10.219032	51
10	9.781134	9.901394	9.879741	10.120259	10.098606	10.218866	50
11	9.781301	9.901298	9.880003	10.119997	10.098702	10.218699	49
12	9.781467	9.901202	9.880265	10.119735	10.098798	10.218532	48
13	9.781634	9.901106	9.880528	10.119472	10.098894	10.218366	47
14	9.781800	9.901010	9.880799	10.119210	10.098990	10 218190	46
15	9.781966	9.900914	9.881052	10.118948	10.099086	10.218034	45
16	9.782132	9.900818	9.881314	10.118686	10.099182	10.217868	44
17	9.782298	9.900721	9.881576	10.118423	10.099278	10.217702	43
18	9.782464	9.900626	9.881839	10.118161	10.097374	10.217536	42
19	9.782630	9.900529	9.882101	10 117899	10.099471	10.217370	41
20	9.782796	9.900433	9.882363	10.117637	10.099567	10.217204	40
21	9.782961	9 900337	9.882625	10.117375	10.099663	10.217039	39
22	9 783127	9.900240	9.882887	10.117113	10.099760	10.216873	38
23	9.783292	9.900144	9.883148	10.116852	10.099856	10.216708	37
24	9.783457	9.900047	9.883410	10.116590	10.099953	10.216542	36
25	9.783623	9.899951	9.883672	10.116328	10.100049	10.216377	35
26	9.783788	9.899854	9.883934	10.116066	10.100146	10.216212	34
27	9.783953	9.899757	9.884196	10.115804	10.100243	10.216047	33
28	9.784118	9.899660	9.884457	10.115543	10.100340	10.215882	32
29	9.784282	9.899564	9 884719	10.115281	10.100436	10.215718	31
30	9.784447	9.899467	9.884980	10.115020	10.100533	10 215553	30
		Sine.		Tang.		Secant.	Min.

52 *Degrees.*

Tangents and Secants.

37 *Degrees.*

Min.	Sine.		Tang.		Secant.		
30	9.784447	9.899467	9.884980	10.115019	10.100533	10.215553	30
31	9.784612	9.899370	9.885242	10.114758	10.100630	10.215388	29
32	9.784776	9.899273	9.885503	10.114496	10.100727	10.215224	28
33	9.784941	9.899176	9.885765	10.114235	10.100824	10.215059	27
34	9.725105	9.899078	9.886026	10.113974	10.100922	10.214895	26
35	9.785269	9.898981	9.886288	10.113712	10.101019	10.214731	25
36	9.785433	9.898884	9.886549	10.113450	10.101116	10.214567	24
37	9.785597	9.898787	9.886810	10.113189	10.101213	10.214403	23
38	9.785761	9.898689	9.887072	10.112928	10.101311	10.214239	22
39	9.785929	9.898582	9.887333	20.112667	10.101408	10.214075	21
40	9.786089	9.898494	9.887594	10.112406	10.101506	10.213911	20
41	9.786252	9.898397	9.887855	10.112145	10.101603	10.213748	19
42	9.786416	9.898299	9.888116	10.111883	10.101701	10.213584	18
43	9.786579	9.898201	9.888377	10.111622	10.101798	10.213420	17
44	9.786742	9.898104	9.888639	10.111361	10.101896	10.213258	16
45	9.786906	9.898006	9.888900	10.111100	10.101994	10.213094	15
46	9.787069	9.897908	9.889160	10.110839	10.102092	10.212931	14
47	9.787232	9.897810	9.889421	20.110579	10.102190	10.212768	13
48	9.787395	9.897712	9.889682	10.110318	10.102288	10.212605	12
49	9.787557	9.897614	9.889943	10.110057	10.102386	10.212443	11
50	9.787720	9.897516	9.890204	10.109796	10.102484	10.212280	10
51	9.787883	9.897418	9.890465	10.109535	10.102582	10.212117	9
52	9.788045	9.897322	9.890725	10.109275	10.102680	10.211955	8
53	9.788208	9.897222	9.890986	10.109014	10.102778	10.211792	7
54	9.788370	9.897123	9.891247	10.108753	10.102877	10.211630	6
55	9.788532	9.897025	9.891507	10.108493	10.102975	10.211467	5
56	9.788694	9.896926	9.891768	10.108232	10.103073	10.211305	4
57	9.788856	9.896828	9.892028	10.107971	10.103172	10.211143	3
58	9.789018	9.896729	9.892289	10.107711	10.103271	10.210982	2
59	9.789180	9.896631	9.892549	10.107451	10.103369	10.210820	1
60	9.789342	9.896532	9.892810	10.107190	10.103468	10.210658	0
		Sine.		Tang.		Secant.	Min.

52 *Degrees.*

A Table of Artificial Sines,

38 *Degrees.*

Min.	Sine.		Tang.		Secant.		
0	9.789342	9.896532	9.892810	10.107190	10 103468	10.210658	60
1	9.789504	9.896433	9.893070	10.106930	10.103567	10.210496	59
2	9.789665	9.896335	9.893331	10.106669	10.103665	10.210335	58
3	9.789827	9.896236	9.893591	10.106409	10.103764	10 210173	57
4	9.789988	9 896137	9.893851	10.106149	10.103863	10.210012	56
5	9.790149	9.896038	9.894111	10.105889	10.003962	10 209851	55
6	9.790310	9.895939	9 884371	10.105628	10.104061	10.209690	54
7	9.790471	9.895840	9.894632	10.105368	10.104160	10.209528	53
8	9.790633	9.895741	9.894892	10.105108	20.104259	10.209367	52
9	9.790792	9.895641	9.895152	10.104848	10.104359	10.209207	51
10	9.790954	9.895542	9.895412	10.104588	10.104458	10.209046	50
11	9 791115	9.895443	9.895672	10.104328	10.104557	10.208885	49
12	9.791275	9.895343	9.895932	10.104068	10.104656	10.208725	48
13	9.791436	9.895244	9.896192	10.103808	10.104756	10.208564	47
14	9.791596	9.895144	9.856452	10.103548	10.104855	10.208404	46
15	9.791757	9.895045	9.896712	10.103288	10.104955	10.208243	45
16	9.791917	9.894945	9.896971	10.103029	10.105055	10.208083	44
17	9.792077	9.894846	9.897231	10.102769	10.105154	10.207923	43
18	9.792237	9.894746	9.897491	10.102500	10.105254	10.207763	42
19	9.792397	9.894646	9.897751	10.102249	10.105354	10.207603	41
20	9.792557	9 894546	9.898010	10.101990	10.105454	10.207443	40
21	9.792716	9.894446	9.898270	10.101730	10.105554	10.207284	39
22	9.792876	9.894346	9.898530	10.101470	10.105654	10.207124	38
23	9.793035	9.894246	9.898789	10.101211	10.105754	10.206964	37
24	9.793195	9.894146	9.899049	10.100951	10.105854	10.206805	36
25	9.793354	9.894046	9.899308	10.100692	10.105954	10.206646	35
26	9.793513	9 893946	9.899568	10.100432	10.106054	10.206480	34
27	9.793673	9 893846	9.899827	10 100173	10.106154	10.206327	33
28	9.793832	9 893745	9.900086	10.099913	10.106255	10.206168	32
29	9.793991	9 893645	9.900346	10.099654	10.106355	10.206009	31
30	9.294150	9 893544	9.900605	10.099395	10.106456	10.205850	30
		Sine.		Tang.		Secant.	Min.

51 *Degrees.*

38 *Degrees.*

Min.	Sine.		Tang.		Secant.		
30	9.794150	9.893544	9.900605	10.099395	10.106456	10.205850	3
31	9.794308	9.893444	9.900864	10.099135	10.106556	10.205692	2
32	9.794467	9.893343	9.901124	10.098876	10.106657	10.205533	2
33	9.794626	9.893243	9.901383	10.098617	10.106757	10.205374	27
34	9.794784	9.893142	9.901642	10.098358	10.106858	10.205216	2
35	9.794942	9.893041	9.901901	10.098099	10.106959	10.205057	25
36	9.795101	9.892940	9.902160	10.097840	10.107060	10.204899	24
37	9.795259	9.892839	9.902419	10.097580	10.107160	10.204741	23
38	9.795417	9.892738	9.902679	10.097321	10.107261	10.204583	22
39	9.795575	9.892637	9.902938	10.097062	10.107362	10.204425	21
40	9.795733	9.892536	9.903197	10.096803	10.107463	10.204267	2
41	9.795891	9.892435	9.903455	10.096544	10.107565	10.204109	1
42	9.796049	9.892334	9.903714	10.096286	10.107666	10.203951	1
43	9.796206	9.892233	9.903973	10.096028	10.107767	10.203794	1
44	9.796364	9.892132	9.904232	10.095768	10.107868	10.203636	1
45	9.796521	9.892030	9.904491	10.095509	10.107970	10.203479	1
46	9.796679	9.891929	9.904750	10.095250	10.108071	10.203321	1
47	9.796836	9.891827	9.905008	10.094992	10.108173	10.203164	1
48	9.796993	9.891726	9.905267	10.094733	10.108274	10.203007	1
49	9.797150	9.891624	9.905526	10.094474	10.108376	10.202850	1
50	9.797307	9.891523	9.905784	10.094215	10.108477	10.202692	1
51	9.797464	9.891421	9.906043	10.093957	10.108580	10.202536	
52	9.797621	9.891319	9.906302	10.093698	10.108681	10.202379	
53	9.797777	9.891217	9.906560	10.093440	10.108783	10.202222	
54	9.797930	9.891115	9.906819	10.093181	10.108885	10.202066	
55	9.798091	9.891013	9.907077	10.092923	10.108987	10.201909	
56	9.798247	9.890911	9.907336	10.092664	10.109089	10.201753	
57	9.798403	9.890809	9.907594	10.092406	10.109191	10.201597	
58	9.798560	9.890707	9.907852	10.092147	10.109293	10.201440	
59	9.798719	9.890605	9.908111	10.091889	10.109395	10.201284	
60	9.798872	9.890503	9.908369	10.091631	10.109497	10.201128	
		Sine.		Tang.		Secant.	

51 *Degrees.*

A Table of Artificial Sines,

39 *Degrees.*

Min	Sine.		Tang.		Secant.		
0	9.798872	9.890503	9.908369	10.091631	10.109497	10.201128	60
1	9.799028	9.890400	9.908627	10.091372	10.109600	10.200972	59
2	9.799184	9.890298	9.908886	10.091114	10.109702	10.200816	58
3	9.799339	9.890195	9.909144	10.090856	10.109805	10.200661	57
4	9.799495	9.890093	9.909402	10.090598	10.109907	10.200505	56
5	9.799651	9.889990	9.909660	10.090340	10.110010	10.200349	55
6	9.799806	9.889888	9.909918	10.090083	10.110112	10.200194	54
7	9.799962	9.889785	9.910177	10.089823	10.110215	10.200038	53
8	9.800117	9.889682	9.910435	10.089565	10.110318	10.199883	52
9	9.800272	9.889579	9.910693	10.089307	10.110421	10.199728	51
10	9.800427	9.889476	9.910951	10.089049	10.110523	10.199573	50
11	9.800582	9.889374	9.911209	10.088791	10.110626	10.199418	49
12	9.800737	9.889271	9.911467	10.088533	10.110729	10.199263	48
13	9.800892	9.889167	9.911724	10.088275	10.110832	10.199108	47
14	9.801047	9.889064	9.911982	10.088018	10.110936	10.198953	46
15	9.801201	9.888961	9.912240	10.087760	10.111039	10.198798	45
16	9.801356	9.888858	9.912498	10.087502	10.111142	10.198644	44
17	9.801511	9.888755	9.912756	10.087244	10.111245	10.198489	43
18	9.801665	9.888651	9.913014	10.086986	10.111349	10.198335	42
19	9.801819	9.888548	9.913271	10.086729	10.111452	10.198181	41
20	9.801973	9.888444	9.913529	10.086471	10.111556	10.198026	40
21	9.802128	9.888341	9.913787	10.086213	10.111659	10.197872	39
22	9.802282	9.888237	9.914044	10.085956	10.111763	10.197718	38
23	9.802435	9.888133	9.914302	10.085698	10.111866	10.197564	37
24	9.802589	9.888030	9.914560	10.085440	10.111970	10.197411	36
25	9.802743	9.887926	9.914817	10.085183	10.112074	10.197257	35
26	9.802897	9.887822	9.915075	10.084925	10.112178	10.197103	34
27	9.803050	9.887718	9.915332	10.084668	10.112282	10.196950	33
28	9.803204	9.887614	9.915590	10.084410	10.112386	10.196796	32
29	9.803357	9.887510	9.915847	10.084153	10.112490	10.196643	31
30	9.803510	9.887406	9.916104	10.083895	10.112594	10.196489	30
		Sine.		Tang.		Secant.	Min.

50 *Degrees.*

39 *Degrees.*

Min.	Sine.		Tang.		Secant.	
30	9.803510	9.887406	9.916104	10.083895	10.112594	10.196489
31	9.803664	9.887302	9.916362	10.083638	10.112698	10.196336
32	9.803817	9.887198	9.916619	10.083381	10.112802	10.196183
33	9.803970	9.887093	9.916876	10.083123	10.112907	10.196030
34	9.804123	9.886989	9.917134	10.082866	10.113011	10.195877
35	9.804276	9.886885	9.917391	10.082609	10.113115	10.195724
36	9.804428	9.886780	9.917648	10.082352	10.113220	10.195572
37	9.804581	9.886676	9.917905	10.082094	10.113324	10.195419
38	9.804734	9.886571	9.918163	10.081837	10.113429	10.195266
39	9.804886	9.886466	9.918420	10.081580	10.113534	10.195114
40	9.805038	9.886362	9.918677	10.081323	10.113638	10.194961
41	9.805191	9.886257	9.918934	10.081066	10.113743	10.194809
42	9.805343	9.886152	9.919191	10.080809	10.113848	10.194657
43	9.805495	9.886047	9.919448	10.080552	10.113953	10.194505
44	9.805647	9.885942	9.919705	10.080295	10.114058	10.194353
45	9.805799	9.885837	9.919962	10.080038	10.114163	10.194201
46	9.805951	9.885732	9.920219	10.079781	10.114268	10.194049
47	9.806103	9.885627	9.920476	10.079524	10.114373	10.193897
48	9.806254	9.885521	9.920733	10.079267	10.114478	10.193746
49	9.806406	9.885416	9.920990	10.079010	10.114584	10.193594
50	9.806557	9.885311	9.921247	10.078753	10.114689	10.193442
51	9.806709	9.885206	9.921503	10.078497	10.114794	10.193291
52	9.806860	9.885100	9.921760	10.078240	10.114900	10.193140
53	9.807011	9.884994	9.922017	10.077983	10.115005	10.192989
54	9.807163	9.884889	9.922274	10.077726	10.115111	10.192837
55	9.807314	9.884783	9.922530	10.077470	10.115217	10.192686
56	9.807465	9.884677	9.922787	10.077213	10.115322	10.192535
57	9.807615	9.884572	9.923044	10.076956	10.115428	10.192385
58	9.807766	9.884466	9.923300	10.076700	10.115534	10.192234
59	9.807917	9.884360	9.923557	10.076443	10.115640	10.192083
60	9.808067	9.884254	9.923813	10.076186	10.115746	10.191932
		Sine.		Tang.		Secant.

50 *Degrees.*

A Table of Artificial Sines,

40 *Degrees.*

	Sine.		Tang.		Secant.		
0	9.808067	9.884254	9.923813	10.076186	10.115746	10.191932	60
1	9.808218	9 884148	9.924070	10.075930	10.115852	10.191782	59
2	9.808368	9.884042	9.924327	10.075673	10.115958	10.191632	58
3	9.808519	9.883936	9.924583	10.075417	10.116064	10.191481	57
4	9.808669	9.883829	9.924840	10 075160	10.116170	10.191331	56
5	9.808819	9.883723	9.925096	10.074904	10.116277	10.191180	55
6	9.808969	9.883617	9.925352	10.074648	10.116383	10.191030	54
7	9.809119	9.883510	9.925609	10.074391	10.116490	10.190881	53
8	9.809269	9.883404	9.925865	10.074135	10.116596	10.190731	52
9	9.809419	9 883297	9 926121	10.073878	10.116703	10.190581	51
0	9.809569	9.883191	9.926378	10.073622	10.116809	10.190431	50
1	9.809718	9.883084	9.926634	10.073366	10.116916	10.190282	49
2	9.809868	9.882977	9.926890	10.073110	10.117023	10.190132	48
3	9.810017	9.882871	9.927147	10.072853	10.117129	10.189983	47
4	9.810167	9.882764	9.927403	10.072597	10.117236	10.189833	46
5	9.810316	9.882657	9.927659	10.072341	10.117343	10.189684	45
6	9.810465	9.882550	9.927915	10.072085	10.117450	10.189535	44
7	9 810614	9.882443	9.928171	10.071829	10.117537	10.189386	43
8	9.810763	9.882336	9 928427	10.071573	10.117664	10 189237	42
9	9.810912	9.882228	9.928683	10.071316	10.117771	10.189088	41
0	9.811061	9.882121	9 928940	10.071060	10.117879	10.188939	40
1	9.811210	9.882014	9.929196	10.070804	10.117986	10.188790	39
2	9.811358	9.881907	9.929452	10.070548	10.118093	10.188642	38
3	9.811507	9.881799	9.929708	10.070292	10.118201	10.188493	37
4	9.811655	9.881692	9.929964	10.070036	10.118308	10.188345	36
5	9.811804	9.881584	9 930219	10 069780	10.118416	10.188196	35
6	9.811952	9.881477	9.930475	10.069524	10.118523	10.188048	34
7	9.812100	9.881369	9.930731	10 069269	10.118631	10.187900	33
8	9.812248	9.881261	9.930987	10.069013	10.118739	10.187752	32
9	9.812396	9.881153	9.931243	10.068757	11.118847	10.187603	31
0	9.812544	9.881045	9.931499	10.068501	10.118954	10.187456	30
		Sine.		Tang.		Secant.	Min.

49 *Degrees.*

40 *Degrees.*

Min.	Sine.		Tang.		Secant.		
30	9.812544	9.881055	9.931499	10.068501	10.118954	10.187456	30
31	9.812692	9.880938	9.931255	10.068245	10.119062	10.187308	29
32	9.812840	9.880830	9.932010	10.067989	10.119170	10.187160	28
33	9.812988	9.880721	9.932266	10.067734	10.119278	10.187012	27
34	9.813135	9.880613	9.932522	10.067478	10.119387	10.186865	26
35	9.813283	9.880505	9 932778	10.067222	10.119495	10.186717	25
36	9.813430	9.880397	9.933033	10.066967	10.119603	10.186570	24
37	9.813578	9.880289	9.833289	10.066711	10.119711	10.186422	23
38	9.813725	9.880180	9.933545	10.066455	10.119820	10.186275	22
39	9.813872	9.880072	9.933800	10.066200	10.119927	10.186128	21
40	9.814019	9.879963	9.934056	10.015944	10.120037	10.185981	20
41	9.814166	9.879855	9.934311	10.065689	10.120145	10.185834	19
42	9.814313	9.879746	9.934567	10.065433	10.120254	10.185687	18
43	9.814460	9.879637	9.934822	10.065177	10.120362	10.185540	17
44	9.814607	9.879529	9.935078	10.064922	10.120471	10.185393	16
45	9.814753	9.879420	9.935333	10.064666	10.120580	10.185246	15
46	9.814900	9.879311	9.935589	10.064411	10.120689	10.185100	14
47	9.815046	9.879202	9.935844	10.064156	10.120798	10.184954	13
48	9.815193	9.879093	9 936100	10.063900	10.120907	10.184807	12
49	9.815339	9.878984	9.936355	10.063645	10.121016	10.184661	11
50	9.815485	9.878875	9.936610	10.063389	10.121125	10.184515	10
51	9.815631	9.878766	9.936866	10.063134	10.121234	10.184368	9
52	9.815778	9.878656	9.937121	10.062879	10.121344	10.184222	8
53	9.815923	9.878547	9.937376	10.062623	10.121453	10.184076	7
54	9.816069	9.878438	9.937632	10.062368	10.121562	10.183931	6
55	9.816215	9.878328	9.937887	10.062113	10.121672	10.183785	5
56	9.816361	9.878219	9.938142	10.061858	10.121781	10.183639	4
57	9.816507	9.878109	9.938397	10.061602	10.121891	10.183493	3
58	9.816652	9.877999	9.938653	10.061347	10.122001	10.183348	2
59	9.816797	9.877890	9.938908	10.061092	10.122110	10 183202	1
60	9.816943	9 877780	9.939163	10.060837	10.122220	10.183057	0
		Sine.		Tang.		Secant.	Min.

49 *Degrees.*

A Table of Artificial Sines,

41 *Degrees.*

	Sine.		Tang.		Secant.		
0	9.816943	9.877780	9.939163	10.060837	10.122220	10.183057	60
1	9.817088	9.877670	9.939418	10.060582	10.122330	10.182919	59
2	9.817233	9.877560	9.939673	10.060327	10.122440	10.182767	58
3	9.817378	9.877450	9.939928	10.060072	10.122550	10.182621	57
4	9.817523	9.877340	9.940183	10.059816	10.122660	10.182476	56
5	9.817668	9.877230	9.940438	10.059561	10.122770	10.182331	55
6	9.817813	9.877120	9.940694	10.059306	10.122880	10.182187	54
7	9.817958	9.877010	9.940949	10.059051	10.122990	10.182042	53
8	9.818103	9.876899	9.941204	10.058796	10.123101	10.181897	52
9	9.818247	9.876789	9.941458	10.058541	10.123211	10.181752	51
0	9.818392	9.876678	9.941713	10.058286	10.123321	10.181608	50
1	9.818536	9.876568	9.941968	10.058032	10.123432	10.181464	49
2	9.818681	9.876457	9.942223	10.057777	10.123543	10.181319	48
3	9.818825	9.876347	9.942478	10.057522	10.123653	10.181175	47
4	9.818969	9.876236	9.942733	10.057267	10.123764	10.181031	46
5	9.819113	9.876125	9.942988	10.057011	10.123875	10.180887	45
6	9.819258	9.876014	9.943243	10.056757	10.123985	10.180743	44
7	9.819401	9.875904	9.943498	10.056502	10.124096	10.180599	43
8	9.819545	9.875793	9.943752	10.056248	10.124207	10.180455	42
9	9.819689	9.875682	9.944007	10.055993	10.124318	10.180311	41
0	9.819832	9.875571	9.944262	10.055738	10.124429	10.180167	40
1	9.819976	9.875459	9.944517	10.055483	10.124541	10.180024	39
2	9.820120	9.875348	9.944771	10.055229	10.124652	10.179880	38
3	9.820263	9.875237	9.945026	10.054974	10.124763	10.179737	37
4	9.820406	9.875126	9.945281	10.054719	10.124874	10.179594	36
5	9.820550	9.875014	9.945535	10.054465	10.124986	10.179450	35
6	9.820693	9.874903	9.945790	10.054210	10.125097	10.179307	34
7	9.820836	9.874791	9.946045	10.053955	10.125209	10.179164	33
8	9.820979	9.874679	9.946299	10.053701	10.125320	10.17902	32
9	9.821122	9.874568	9.946554	10.053446	10.125432	10.178878	31
0	9.821265	9.874456	9.946808	10.053192	10.125544	10.178735	30
		Sine.		Tang.		Secant.	Min.

48 *Degrees.*

41 Degrees.

Min.	Sine.		Tang.		Secant.	
30	9.821265	9.874456	9.946805	10.053192	10.125544	10.178735
31	9.821407	9.874344	9.947063	10.052937	10.125656	10.178593
32	9.821550	9.874232	9.947317	10.052682	10.125767	10.178450
33	9.821693	9.874120	9.947572	10.052428	10.125879	10.178307
34	9.821835	9.874008	9.947826	10.052173	10.125991	10.178165
35	9.821977	9.873896	9.948081	10.051919	10.126103	10.178022
36	9.822120	9.873784	9.948335	10.051664	10.126216	10.177880
37	9.822262	9.873672	9.948590	10.051410	10.126328	10.177738
38	9.822404	9.873560	9.948844	10.051156	10.126440	10.177596
39	9.822546	9.873448	9.949099	10.050901	10.126552	10.177454
40	9.822688	9.873335	9.949353	10.050647	10.126665	10.177312
41	9.822830	9.873223	9.949607	10.050392	10.126777	10.177170
42	9.822972	9.873110	9.949862	10.050138	10.126900	10.177028
43	9.823114	9.872998	9.950116	10.049884	10.127002	10.176886
44	9.823255	9 872885	9.950370	10.049629	10.127115	10.176744
45	9.823397	9.872772	9.950625	10.049375	10.127228	10.176603
46	9.823539	9.872659	9.950879	10.049121	10.127341	10.176461
47	9.823680	9.872547	9.951133	10.048867	10.127453	10.176320
48	9.823821	9.872434	9.951388	10.048612	10.127566	10.176179
49	9.823963	9.872321	9.951642	10.048358	10.127679	10.176037
50	9.824104	9.872208	9.951896	10.048104	10.127792	10.175896
51	9.824245	9.872094	9.952150	10.047850	10.127905	10.175755
52	9 824386	9.871981	9.952404	10.047595	10.128019	10.175614
53	9.824527	9.871868	9.952659	10.047341	10.128132	10.175473
54	9.824668	9.871755	9.952913	10.047087	10.128245	10.175332
55	9.824808	9.871641	9.953167	10 046833	10.128359	10.175192
56	9.824949	9.871528	9.953421	10.046579	10.128472	10.175051
57	9.825090	9.871414	9.953675	10.046325	10.128586	10.174910
58	9.825230	9.871301	9.953929	10.046071	10.128699	10.174770
59	9.825370	9.871187	9.954183	10.045817	10.12881	10.174629
60	9 825511	9.871073	9.954437	10.045562	10.128926	10.174489
		Sine.		Tang.		Secant.

48 Degrees.

42 Degrees.

Min.	Sine.		Tang.		Secant.		
0	9.825511	9.871073	9.954437	10.045563	10.128926	10.174489	60
1	9.825651	9.870960	9.954691	10.045308	10.129040	10.174349	59
2	9.825791	9.870846	9.954945	10.045054	10.129154	10.174209	58
3	9.825931	9.870732	9.955199	10.044800	10.129268	10.174069	57
4	9.826071	9.870618	9.955453	10.044546	10.129382	10.173928	56
5	9.826211	9.870504	9.955707	10.044292	10.129496	10.173789	55
6	9.836351	9.870390	9.955961	10.044038	10.129610	10.173649	54
7	9.826491	9.870276	9.956215	10.043785	10.129724	10.173509	53
8	9.826631	9.870161	9.956469	10.043531	10.129839	10.173370	52
9	9.826770	9.870047	9.956723	10.043277	10.129953	10.173230	51
10	9.826910	9.869933	9.956977	10.043023	10.120067	10.173090	50
11	9.827049	9.869818	9.957231	10.042769	10.120182	10.172951	49
12	9.827189	9.869704	9.957485	10.042515	10.120296	10.172811	48
13	9.827328	9.869589	9.957739	10.042261	10.120411	10.172672	47
14	9.827467	9.869474	9.957993	10.042007	10.120526	10.172533	46
15	9.827606	9.869360	9.958246	10.041753	10.130640	10.172394	45
16	9.827745	9.869245	9.958500	10.041500	10.130755	10.172255	44
17	9.827884	9.869130	9 958754	10.041246	10.130870	10.172116	43
18	9.828023	9 869015	9.959008	10.040992	10.130985	10.171977	42
19	9.828162	9.868900	9.959262	10.040738	10.131100	10.171838	41
20	9.828301	9.868785	9.959515	10.040484	10.131215	10.171699	40
21	9.828439	9.868670	9.959770	10.040231	10.131330	10.171561	39
22	9.828578	9 868555	9.960023	10.039977	10.131445	10.171422	38
23	9.828716	9.868440	9.960277	10.029723	10.131560	10.171284	37
24	9.828855	9.868324	9.960530	10.039470	10.131676	10.171145	36
25	9.828993	9 868209	9.960784	10.039216	10.131791	10.171007	35
26	9.829131	9 868093	9.961038	10.038962	10.131907	10.170869	34
27	9.829269	9.867978	9.961291	10.038708	10.131022	10.170731	33
28	9.829407	9.867862	1.961545	10.038455	10.132138	10.170591	32
29	9.829545	9.867747	9.961799	10.038201	10.132253	10.170455	31
30	9.829683	9.867631	9.962052	10 037947	10.132369	10.170317	30
		Sine.		Tang.		Secant.	Min.

47 Degrees.

Tangents and Secants.

43 *Degrees.*

Min.	Sine.		Tang.		Secant.		
30	9.829683	9.867631	9.962052	10.037947	10.132369	10.170317	30
31	9.829821	9.867515	9.96230[illegible]	10.037694	10.132485	10.170179	29
32	9.829959	9.867399	9.962560	10.037440	10.132601	10.170041	28
33	9.830097	9.867283	9.962813	10.037187	10.132717	10.169903	27
34	9.830234	9.867167	9.963067	10.0[illegible]933	10.132833	10.169766	26
35	9.830372	9.867051	9.963320	10.036680	10.132949	10.169628	25
36	9.830509	9.866935	9.963574	10.036426	10.133065	10.169491	24
37	9.830646	9.866819	9.963827	10.036172	10.133181	10.169354	23
38	9.830784	9.866703	9.964081	10.035919	10.133297	10.169216	22
39	9.830921	9.866587	9.964335	10.035665	10.133414	10.169079	21
40	9.831058	9.866470	9.964588	10.035412	10.133530	10.168942	20
41	9.831195	9.866353	9.964842	10.035158	10.133647	10.168805	19
42	9.831332	9.866237	9.965095	10.034905	10.133763	10.168668	18
43	9.831469	9.866120	9.965349	10.034651	10.133880	10.168531	17
44	9.831606	9.866004	9.965602	10.034399	10.133997	10.168394	16
45	9.831742	9.865887	9.965855	10.034144	10.134113	10.168257	15
46	9.831879	9.865770	9.966109	10.033891	10.134230	10.168121	14
47	9.832015	9.865653	9.966362	10.033638	10.134347	10.167984	13
48	9.832152	9.865536	9.966616	10.033384	10.134464	10.167848	12
49	9.832288	9.865419	9.966869	10.033131	10.134581	10.167712	11
50	9.832425	9.865302	9.967122	10.032877	10.134698	10.167575	10
51	9.832561	9.865185	9.967376	10.032624	10.134815	10.167439	9
52	9.832697	9.865068	9.967630	10.032371	10.134932	10.167303	8
53	9.832833	9.864950	9.967883	10.032117	10.135050	10.167167	7
54	9.832970	9.864833	9.968136	10.031864	10.135167	10.167031	6
55	9.833105	9.864716	9.968389	10.031611	10.135284	10.166895	5
56	9.833241	9.864598	9.968643	10.031357	10.135402	10.166759	4
57	9.833377	9.864481	9.968897	10.031104	10.135519	10.166623	3
58	9.833512	9.864363	9.969150	10.030851	10.135637	10.166488	2
59	9.833648	9.864245	9.969403	10.030597	10.135755	10.166352	1
60	9.833783	9.864127	9.969656	10.030344	10.135872	10.166217	0
		Sine.		Tang.		Secant.	Min.

47 *Degrees.*

A Table of Artificial Sines,

43 *Degrees.*

	Sine.		Tang.		Secant.		
0	9.833783	9.864127	9.969656	10.030344	10.135872	10.166217	60
1	9.833919	9.864010	9.969909	10.030091	10.135990	10.166081	59
2	9.834054	9.863892	9.970162	10.029838	10.136108	10.165946	58
3	9.834189	9.863774	9.970416	10.029584	10.136226	10.165811	57
4	9.834325	9.863656	9.970669	10.029331	10.136344	10.165675	56
5	9.834460	9.863538	9.970922	10.029078	10.136462	10.165540	55
6	9.834595	9.863419	9.971175	10.028825	10.136581	10.165405	54
7	9.834730	9.863301	9.971429	10.028571	10.136699	10.165270	53
8	9.834865	9.863183	9.771682	10.028318	10.136817	10.165135	52
9	9.834999	9.863064	9.971935	10.028065	10.136936	10.165001	51
10	9.835134	9.862946	9.972188	10.027812	10.137054	10.164866	50
11	9.835269	9.862827	9.972441	10.027559	10.137173	10.164731	49
12	9.835403	9.862709	9.972694	10.027305	10.137291	10.164597	48
13	9.835538	9.862590	9.972948	10.027052	10.137410	10.164462	47
14	9.835672	9.862471	9.973201	10.026799	10.137529	10.164328	46
15	9.835807	9.862353	9.973454	10.026546	10.137647	10.164193	45
16	9.835941	9.862234	9.973707	10.026293	10.137766	10.164059	44
17	9.836075	9.862115	9.973960	10.026040	10.137885	10.163925	43
18	9.836209	9.861996	9.974213	10.025787	10.138004	10.163791	42
19	9.836343	9.861877	9.974466	10.025534	10.138123	10.163657	41
20	9.836477	9.861758	9.974719	10.025280	10.138242	10.163523	40
21	9.836611	9.861638	9.974973	10.025027	10.138362	10.163389	39
22	9.836745	9.861519	9.975226	10.024774	10.138481	10.163255	38
23	9.836878	9.861400	9.975479	10.024521	10.138600	10.163122	37
24	9.837012	9.861280	9.975732	10.024268	10.138720	10.162988	36
25	9.837146	9.861161	9.975985	10.024015	10.138839	10.162854	35
26	9.837279	9.861041	9.976238	10.023762	10.138959	10.162721	34
27	9.837412	9.860921	9.976491	10.023509	10.139078	10.162587	33
28	9.837546	9.860802	9.976744	10.023256	10.139193	10.162454	32
29	9.837679	9.860682	9.976997	10.023003	10.139318	10.162321	31
30	9.837812	9.860562	9.977250	10.022750	10.139438	10.162188	30
		Sine.		Tang.		Secant.	Min.

46 *Degrees.*

43. *Degrees.*

Min.	Sine.		Tang.		Secant.		Min.
30	9.837812	9.860562	9.977250	10.022750	10.139438	10.162188	
31	9.837945	9.860442	9.977503	10.022497	10.139558	10.162055	
32	9.838078	9.860322	9.977756	10.022244	10.139678	10.161922	
33	9.838211	9.860202	9.978009	10.021991	10.139798	10.161789	
34	9.838344	9.860082	9.978262	10.021738	10.139918	10.161656	
35	9.838477	9.859962	9.978515	10.021485	10.140038	10.161523	
36	9.838697	9.859842	9.978768	10.021232	10 140158	10.161390	
37	9.838742	9.859721	9.979021	10.020979	10.140279	10.161258	
38	9.838875	9.859601	9.979274	10.020726	10.140399	10.161125	
39	9.839007	9.859480	9.979527	10.020473	10.140520	10.160993	
40	9.839140	9.859360	9.979780	10.020220	10.140640	10.160860	
41	9.839272	9.859239	9.980033	10.019967	10.140761	10.160728	
42	9.839404	9.859119	9.980286	10.019714	10.140881	10.160596	
43	9.839536	9.858998	9.980538	10.019461	10.141002	10.160464	
44	9.839668	9.858877	9.980791	10.019209	10.141123	10.160332	
45	9.839800	9.858756	9.981044	10.018956	10.141244	10.160200	
46	9.839932	9.858635	9 981297	10.018703	10.141365	10.160068	
47	9.840064	9.858514	9.981550	10.018450	10.141486	10.159936	
48	9.840196	9.858393	9.981893	10.018197	10 141607	10.159804	
49	9.840328	9.858272	9.982056	10.017944	10.141728	10.159672	
50	9.840460	9.858150	9.982309	10.017691	10.141849	10.159541	
51	9.840591	9.858029	9.982562	10.017438	10.141971	10.159409	
52	9.840722	9.857908	9.982814	10.017185	10.142092	10.159278	
53	9.840854	9.857786	9.983067	10.016933	10.142214	10.159146	
54	9.840985	9.857665	9.983320	10.016680	10.142335	10.159015	
55	9.841116	9.857543	9.983673	10.016427	10.142457	10.158884	
56	9.841247	9.857421	9 983826	10.016174	10.142579	10.158753	
57	9.841378	9.857300	9.984079	10.015921	10.142700	10.158621	
58	9.841509	9.857178	9.984331	10.015668	10.142822	10.158490	
59	9.841640	9.857056	9.984584	10.015416	10.142944	10.158360	
60	9.841771	9.856934	0.984837	10.015163	10.143066	10.158229	
		Sine.		Tang.		Secant.	Min.

46 *Degrees.*

A Table of Artificial Sines,

44 *Degrees.*

	Sine.		Tang.		Secant.		
0	9.841771	9.856934	9.984837	10.015163	10.143066	10.158229	60
1	9.841902	9.856812	9.985090	10.014910	10.143188	20.158098	59
2	9.842033	9.856690	9.985343	10.014657	10.143310	10.157967	58
3	9.842163	9.856568	9.985596	10.014404	10.143332	10.157837	57
4	9.842204	9.856445	9.985848	10.014152	10.143554	10.157706	56
5	9.842434	9.856323	9.986101	10.013899	10.143677	10.157576	55
6	9.842555	9.856201	9.986354	10.013646	10.143799	10.157445	54
7	9.842685	9.856078	9.986607	10.013393	10 143922	10.157315	53
8	9.842815	9.855956	9.986860	10.013140	10.144044	10.157185	52
9	9.842946	9.855833	9.987112	10.012888	10.144167	10.157054	51
10	9.843076	9.855711	9.987365	10.012635	10.144289	10.156924	50
11	9.843206	9.855588	9.987618	10.012382	10.144412	10.156794	49
12	9.843336	9.855465	9.987871	10.012129	10.144535	10.156664	48
13	9.843465	9.855342	9.988123	10 011877	10.144658	10.106534	47
14	9.84359	9.855219	9.988376	10.011624	10.144781	10.156405	46
15	9.843725	9.855096	9.988629	10.011371	0.144904	10.156275	45
16	9.843855	9.854973	9.988882	10.011118	10.145027	10.156145	44
17	9.843984	9.854850	9.989134	10.010866	10.145150	10.156016	43
18	9.844114	9.854727	9.989387	10.010613	10.145273	10.155886	42
19	9.84424	9.85460	9.989640	10.010360	10.145397	10.155757	41
20	9.844372	9.894480	9.989893	10.010107	10.145520	10.155627	40
21	9.844502	9.854356	9.990140	10.009855	10.145644	10.155498	39
22	9.844631	9.854233	9.990398	10.009602	10.145767	10.155369	38
23	9.844760	9.854109	9.990651	10.009349	10.145891	10.155240	37
24	9.844889	9.853980	9.990903	10.009096	10.146014	10.155111	36
25	9.845018	9.853862	9.991156	10 008844	10.146138	10.154982	35
26	9.845147	9.853738	9.991409	10.008591	10.146262	10.154853	34
27	9.845276	9.853614	9.991662	10.008338	10.146386	10.154724	33
28	9.845404	9.853490	9.991914	10.008086	10.146510	10.154595	32
29	9.845533	9.853366	9.992167	10.007833	10.146634	10.154467	31
30	9.845662	9.853242	9.992420	10.007580	10.146758	10.154338	30
		Sine.		Tang.		Secant.	Min.

45 *Degrees.*

Tangents and Secants.

44 *Degrees.*

Min.	Sine.		Tang.		Secant.		
30	9.845662	9.853242	9.992420	10.007580	10.146758	10.154338	30
31	9.845790	9.853118	9.992672	10.007328	10.146882	10.154210	29
32	9.845919	9.852994	9.992925	10,007075	10.147006	10.154081	28
33	9.846047	9.852869	9.993178	10.006822	10.147131	10.153952	27
34	9.846175	9.852745	9.993430	10.006569	10.147255	10.153825	26
35	9.846304	9.852620	9.993083	10.006317	10.147380	10.153696	25
36	9.846432	9.852496	9.993936	10.006064	10.147504	10.153568	24
37	9.846551	9.852371	9.994189	10.005811	10.147629	10.153440	23
38	9.846688	9.852247	9.994441	10.005559	10.147750	10.153312	22
39	9.846816	9.852122	9.994694	10.005306	10.147878	10.153184	21
40	9.846944	9.851997	9.994947	10.005053	10.148003	10.153056	20
41	9.847074	9.851872	9.995199	10.004801	10.148128	10.152929	19
42	9.847199	9.851747	9.995452	10.004548	10.148253	10.152801	18
43	9.847327	9.851622	9.995705	10.004295	10.148378	10.152673	17
44	9.847454	9.851497	9.995957	10.004043	10.148503	10.152546	16
45	9.847582	9.851372	9.996210	10.003790	10.148628	10.152418	15
46	9.847709	9.851246	9.996463	10.003537	10.148753	10.152291	14
47	9.847836	9.851121	9.996715	10.003285	10.148879	10.152163	13
48	9.847964	9.850996	9.996968	10.003032	10.149004	10.152036	12
49	9.848091	9.850870	9.997221	10.002779	10.149130	10.151909	11
50	9.848218	9.850745	9.997473	10.002527	10.149255	10.151782	10
51	9.848345	9.850619	9.997726	10.002274	10.149381	10.151655	9
52	9.848472	9.850493	9.997979	10.002021	10.149507	10.151528	8
53	9.848599	9.850367	9.998231	10.001769	10.149632	10.151401	7
54	9.848726	9.850242	9.998484	10.001516	10.149758	10.151274	6
55	9.848852	9.850116	9.998737	10.001263	10.149884	10.151148	5
56	9.848979	9.849990	9.998989	10.001011	10.150010	10.151021	4
57	9.849106	9.849864	9.999242	10.000758	10.150136	10.150894	3
58	9.849232	9.849737	9.999495	10.000505	10.150262	10.150768	2
59	9.849359	9.849611	9.999747	10.000253	10.150389	10.150641	1
60	9.849485	9.849485	10.000000	10.000000	10.150515	10.150515	0
		Sine.		Tang.		Secant.	Min.

45 *Degrees.*

Of the Nature and Uſe of the Table of Logarithms.

IT will be convenient to ſay ſomething of their Nature and Origen, which is from hence.

If to a Rank of continual Proportionals in a Geometric Progreſſion from Unity. Suppoſe,

1, 2, 4, 8, 16, 32, 64, &c.

We accommodate a Rank of Exponents in an Arithmetick Progreſſion, from 0. Suppoſe,

0, 1, 2, 3, 4, 5, &c.

It will be manifeſt, that for every Multiplication or Diviſion of the Terms in the Geometric Progreſſion one by another, there is an anſwerable Addition or Subduction of the Exponents.

For, as in the Terms of the Geometrical Progreſſion, 4, Multiplyed by 8, makes 32. So in the Exponents or Arithmetical Progreſſion; if to 2, the Exponent of 4, there be added 3, the Exponent of 8, it makes 5 the Exponent of 32 the Product; and as 32 divided by 8, gives 4 for the Quotient; ſo if from 5 the Exponent of 32, we ſubſtract 3 the Exponent of 8, the Remainder is 2 the Exponent of 4 the Quotient.

Terms in Geometrical Prog. 1, 2, 4, 8, 16, 32, 64, &c.
Terms in Arithm. Prog. or Expon. 0, 1, 2, 3, 4, 5, 6, &c.

$$4 \times 8 = 32 \qquad \frac{32}{8} = 4$$

$$2 + 3 = 5 \qquad 5 - 3 = 2$$

And the ſame holds if between any two of thoſe Terms, we interpoſe one or more Geometric mean Proportionals, and between their Exponents as many Arithmetick means.

B

For if between 4 and 8 (or between 2 and 16) we interpoſe a Geometric Mean $\sqrt{32}$, that is, $4\sqrt{2}$, and between 2 and 3 (or 1 and 4) An Arithmetick Mean $2\frac{1}{2}$ then as $4\sqrt{2} \times 8$ makes $32\sqrt{2}$ (a mean Proportional between 32 and 64) ſo adding their Exponents $2\frac{1}{2}$ and 3 makes $5\frac{1}{2}$ an Arithmetick Mean between 5 and 6, and Univerſally (whatever be the values of r, e,) ſuppoſing.

The Terms.	1.	r.	rr.	rrr.	r^4.	r^5.	r^6.	&c.
Exponents.	0.	e.	2e.	3e.	4e.	5e.	6e.	&c.

Then as $rr \times r^3 = r^5$ & $\sqrt{rr} \times r^3 = r^5\sqrt{r}$

So $2e \times 3e = 5e$ & $2\frac{1}{2}e \times 3e = 5\frac{1}{2}e$.

And ſo every where, and if for 0, e, 2e, 3e, &c.

We take (ſuppoſing $e = 1$) 0, 1, 2, 3, 4, &c. then doth this Exponent always gives us the Number of Ratios or Dimenſions in the Terms to which it belongs, that is how often the Ratio is Multiplied into it ſelf continually to produce that Term to which it belongs.

1.	r.	r^2.	r^3,	r^4.	r^5.	r^6.	&c.
0.	1.	2.	3.	4.	5.	6.	&c.

(as 3 in r^3 : 6 in r^6. and ſo every where) or ſhews how many Fold the Proportion of r^6 to 1. is of r to 1. That is, how many Ratios of r to 1 makes r^6 to 1. *viz.* 6. to which the Name of Logarithms fitly anſwers, which is derived from a Greek Word ſignifying *The Number of Proportions ſo compounded.*

Now this being the Foundation from whence the invention of Logarithms is deduced. It was in the next place proper to take ſuch a Rank of Geometrical Progreſſional as was moſt accommodate to our way of Notation of Numbers, where places are in a Decuple Order. *viz.*

Terms.	1.	10.	100.	1000.	10000.	100000.	1000000.	&c.
Exp.	0.	1.	2.	3.	4.	5.	6.	&c.

Or thus.

1		0.0000000
10		1.0000000
100		2.0000000
1000	Exponents	3.0000000
10000		4.0000000
100000		5.0000000
1000000		6.0000000

Now ſince 0, is the Log. of 1, and 1 of 10, therefore all Logarithms between 1 and 10, will be only a Decimal Fraction; that is, there will be 0 on the left hand the Point, that is, in the place of Units; and for the ſame reaſon, ſince the Log. of 10 is 1, and of 100, 2. Therefore all the Numbers between 10 and 100. will have 1 in the Place of Units, and a Decimal Fraction annexed; all Numbers between 100 and 1000 will have 2 in the Place of Units, and a Decimal annexed; between 1000 and 10000. 3 in the place of Units and a Decimal annexed, *&c.*

That Number which ſtands in the Place of Units is called the Characteriſtic, and ſerves to ſhew the Number of Places of that Number of which it is a Logarithm, *viz*, One more than is expreſt by that digit of the Log. ſtanding in the place of Units.

So if 0 ſtand in the place of Units in the Logarithm, the Logarithm is the Logarithm of a Number that conſiſts but of one place, *viz.* between 1 and 10.

If 1 be the Characteriſtic of the Logarithm, it belongs to a Number between 10 and 100, *viz.* of two places. If 2 be the Characteriſtic, the Number hath 3 places, *viz.* between 100 and 1000, *&c.*

Or which comes to the ſame thing, the Characteriſtic gives you the diſtance of the higheſt place in the Number from Unity. For Example.

385. Five ſtands in the place of Units, 8 in the 1ſt. from Unity and therefore its Exponent is 1, 3 ſtands in the 2d place from Unity, and therefore its Exponent is 2.

But ſince 0 is the Exponent or Logarithm of 1, therefore all Fractions will have the Exponent of their Logarithm. Negative,

As for inſtance of this Decimal Fraction, 0095 its Exponent or Characteriſtic ſhall be 3, which ſhews that the higheſt Figure here, is diſtant from the place of Units by 3, *viz.* on the right hand from Unity, as the diſt. of the higheſt Fig. of this Number, 9500 would have been + 3. Therefore when the Characteriſtic is affirmative, 'tis the Logarithm of a whole Number, or of a mixt Number, But when Negative, 'tis the Logarithm of a *Fraction*.

From what hath been ſaid you may eaſily perceive the reaſon why the Addition of the Logarithms anſwers to the Multiplication of the Numbers they are Logarithms of; and that the Subtraction of Logarithms or Diff. of the Log. ſo found Anſwers to the Quotient reſulting from the Diviſion of the Correſpondent Numbers.

The way of finding the intermediate Logarithms between 1 and 10, between 10 and 100, *&c.* ſince 'tis ſhewed in ſeveral other Treatiſes, I ſhall omit, and will now proceed to ſhew you how to uſe the Table already made, whoſe uſe conſiſts of theſe 2 Parts.

1. A Number being given to find its Logarithm.
2. A Logarithm being given to find its Correſpondent Numbers.

In the firſt Page of this Table is contained the Logarithms of all Numbers to 100 with their Characteriſtics prefixt to them.

Thus againſt the Number 39 is its Log. 1.591064
againſt 86 is its Log. 1.934498

The left hand Column of each following Page contains Numbers increaſing in their Natural Order from 100 to 999; and in the next Column to it, having 0 on the Head, and againſt any Num. between thoſe limits is the Decimal Part of the Logarithm requir'd, to which you muſt annex its proper Index.

For inſtance, ſuppoſe I would find the Logarithm of 765. I look for 765 in the left hand Column, and againſt it in the

Column under 0, is, 883661 to which if I prefix its prop Index 2. and it becomes 2.883661.

$$\text{Thus the Logarithms of}\left\{\begin{array}{l}126\\520\\172\end{array}\right\}\text{are}\left\{\begin{array}{l}2.100370\\2.716003\\2.235528\end{array}\right.$$

The other 5 Colums of each Page contains the Logarithms all Numbers from 1000 to 9999. Thoſe on the left hand Pag are diſtinguiſhed on the top with the Figures 0, 1, 2, 3, 4. the on the right hand with 5, 6, 7, 8, 9.

To find the Logarithm of a Number conſiſting of 4 place as ſuppoſe 3759, I look for the 3 firſt Figures under Num. the left hand Column, and for the laſt at the Top: Then that Column under the laſt Fig. and againſt the 3 firſt Figur in the left hand Column is the Decimal of the Log. *viz.* 57307 To which prefixing its proper Index 3, it becomes, 3.573072.

$$\text{And thus the Log. of}\left\{\begin{array}{l}375.9\\37.59\\3.759\\.3759\\.03759\end{array}\right\}\text{is}\left\{\begin{array}{l}2.573072\\1.573072\\0.573072\\1.573072\\2.573072\end{array}\right.$$

Now Since 0 is the Logarithm of 1, the Logarithm of all Fra ctions muſt be Negative, but may be expreſt after two differen ways, either ſo, as that the Note of Negation may affect the whol Logarithm, or only the Characteriſtic, leaving the Decima part of the Logarithm to be underſtood as affirmative.

For Example, $\frac{3}{8}$ or which is Equivalent 0.375 this Fractio ſuppoſes the Numerator 3 to be divided by the Denomina tor 8, which in Logarithms is Log. 3. 0.477121
to be perform'd by Subtracting Log. 8. 0.903089
the Log. of 8. from that of 3. Log. $\frac{3}{8}$ —0.425968
and the Remainder will be the Logarithm of $\frac{3}{8}$ which wil then be the Negative Quantity—0.4259687
or according to the former Method the Log. of $\frac{3}{8}$ =0.375 is —1.5740312. Where the Index only is Negative, and Deci-

al Affirmative. Now though theſe two Expreſſions ſeem different they are really the ſame. For,

$$\begin{array}{r} -1.0000000 \\ +0.5740312+ \\ \text{is} = -0.4259687. \end{array}$$

Now if a Logarithm be given, and 'tis requir'd to find the Abſolute Number thereto belonging.

The Characteriſtic ſerves only to ſhew you of how many Places it conſiſts.

Rule.

Reject the Characteriſtic, and look for the Decimal Part in the Table, which if you find it not exact, take the neareſt, and the Number anſwering to that Decimal Part is the Number required. Only let this be obſerved that you take only ſo many places of this Number ſo found from the left hand, as is one more than the Index or Characteriſtic of your Logarithm. Thoſe Figures (if any be) that remain are Decimal Parts.

Thus the Number anſwering to the Log.

3.072617	is	1182
2.072617	is	118.2
1.072617	is	11.82
0.072617	is	1.182

Of the Uſe of the Table of Logarithms, Sines, Tangents, and Secants.

1. Every Page is divided into 8 Columns, the firſt and laſt of which contains the Minutes of every Degree, and the other Six the Logarithm Sines, Tangents, and Secants, of thoſe Degrees and Minutes.

2. The {Left / Right} hand Col. of each P. {Under / Over} Min. at the {Head / Foot} Of the Tab. contains the Min. of thoſe Degrees {Leſs / More} than 45

And increaſe in their $\left\{\begin{matrix}\text{Deſcent}\\\text{Aſcent}\end{matrix}\right\}$ from 0 to 60 Minutes.

**To find the Sine, Tangent and Secant, of any Degree an
Minute given.**

Rule.

If the Degrees be $\left\{\begin{matrix}\text{Leſs}\\\text{More}\end{matrix}\right\}$ than 45 Deg. they are found i
thoſe Columns which have the words Sine, Tangent, Secant.
at the $\left\{\begin{matrix}\text{Head}\\\text{Foot}\end{matrix}\right\}$ of the Table.

Example.

Suppoſe the Sine, Tangent and Secant of 7 Degrees, 29 M
nutes were required.

Look for 7 Degrees on the top of the Table, and in the fir
Column of the left hand Page you'l find 29 under Min. again
which and under Sine, you'l find 9.114737. Under Tangent you
find 9.118452. Under Secant you'l find 10.003715. Which a
the Log. Sine, Tangent, and Secant, Required.

And a Sine, Tangent, or Secant, being given to find the D
grees and Minutes belonging to it is but the Reverſe, and there
fore I ſhall forbear any farther inſtances.

It remains now that I ſhew you how from the Logarithm Sin
Tangent, Secant; to find the natural Sine, Tangent, and Secan

The Index to the Radius of the Table of Logarithms, Sine
&c. is 10, and conſequently the Natural Number anſwering
it is of 11 places, *viz.* 10000000000. If this Radius and all th
Natural Sines, *&c.* to this Radius were divided by a Millio
or which is the ſame ſix places cut off, the Radius will becom
10000. and the Figures remaining in the Sines, Tangents, *&*
ſhall be Sines, Tangents, *&c.* to the Radius 10000, *viz.* ſo f
as this Table of Logarithms goes, which will be effected in th
Table of Logarithms, Sines, *&c.* by ſubtracting always 6 fro
the Exponent, and then the Remainder will be Logarithm.
Natural Number expreſſing the Sine, Tangent, and Secant
the Radius 10000, which may be found by the Table of Log
rithm.

For inſtance, having the Log. Sine, Tangent and Secant of 37. 30. In the Table, to find from thence the natural Sine, Tangent and Secant to the Rad. 10000.

Log. Sine.	Log. Tangent	Log. Secant
9.784447,	9.884980.	10.100533

Subſtracting 6 from the Exponent.

they become

3.784447.	3.884980.	4.100533

Which Logarithms look'd for in the Table, the Natural Numbers anſwering them, are,

Nat. Sine.	Nat. Tangent.	Nat. Secant.
6087	7673.	12600

Of ſuch parts of which the Radius contains 10000.

FINIS.
